MARVELS OF THE ANIMAL WORLD

KANGAROOS THAT CLIMB TREES. [*Frontispiece.*]

MARVELS OF THE ANIMAL WORLD

BY

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WITH NUMEROUS PHOTOGRAPHIC
ILLUSTRATIONS BY THE AUTHOR

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PREFACE

IN the following pages it has been the aim of the author to bring before the reader's notice the curious habits, varied dispositions, and peculiar characteristics of different types of animal life. With that end in view, he has surveyed the members of the Animal Kingdom from numerous aspects, and incorporated under various chapter headings a number of facts bearing upon the lives and ways of beasts, birds, reptiles, fish and insects. The service of the camera has been enlisted to bring more clearly before the eyes of the reader some of the marvels of the animal world which have been briefly referred to in the letterpress, and it is hoped that the photographs will prove of interest.

W. S. B.

CONTENTS

CHAP.		PAGE
I	Animals which Sham Death	19
II	Animals as Prize-fighters	32
III	Some Curious Domestic Sheep of Foreign Lands	45
IV	Concerning Eggs and Those that Lay Them	54
V	Curious Messmates	75
VI	Wild Animals which are Trained by Man to Hunt	86
VII	Animal Sanctuaries	105
VIII	Mammals as Nest Builders	121
IX	Animal Products	137
X	The Offensive and Defensive Weapons of Animals	159
XI	Animals which Give Electric Shocks	180
XII	Animal Locomotion	187
XIII	Poisonous Animals	204
XIV	A Mighty Atom	228
XV	Concerning Goldfish and their Kindred	231
XVI	A Talk about Kangaroos	239

LIST OF ILLUSTRATIONS

	TO FACE PAGE
Kangaroos that Climb Trees . .	*Frontispiece*
A Fire-bellied Toad Shamming Death . . .	24
A Hog-nosed Snake Posing as a Cobra . . .	24
A Hog-nosed Snake Shamming Death . . .	25
A Dingo Dog	25
An American Opossum—an Adept at Feigning Death	32
Azara's Dog—an Expert in the Art of Deception .	32
The Land-rail or Corn-crake	33
A Mantis or Praying Insect	33
A Unicorn Sheep—a Domestic Breed from Nepal .	48
A Young Alligator Emerging from its Egg . .	48
Some Curious Eggs	49
Perch Spawn—it Resembles a Piece of Lace . .	49
A Joy-ride—Monkey and Wombat	80
A Strange Foster-mother—a Cat and Squirrel . .	80
Strange Messmates—a Young Hare and Young Blackbirds	81
A Triple Alliance—Hermit Crab, Anemone and Nereis	81
A Pair of Cheetahs or Hunting Leopards . .	96
An Indian Mongoose—a Famous Rat-catcher . .	96

TO FACE PAGE

A Peregrine Falcon Wearing its Hood . . . 97

The Goshawk—the Largest of the Hawk Family . 97

The Nest of an Orang-utan 128

A Rat-kangaroo—a Species that Makes a Nest . 128

Section of Mole's Nest, showing Underground Galleries 129

The Beaver, which Dams Rivers and Builds Lodges . 129

The Woolly Monkey, which is Eaten by the Natives of S. America 144

The Green Turtle from which the Famous Turtle Soup is Made 144

A Rorqual, one of the Whales that Yields Whalebone 145

The Rattlesnake, whose Poison is Used to Cure Yellow Fever 145

A Walrus with Finely-developed Tusks . . . 176

The Horn of a Rhinoceros is composed of Tightly-packed Hair Fibres 176

The Crested Porcupine Possesses an Armament of Penetrating Quills 177

A Scorpion Elevating its Sting 177

The Hind Limbs of a Seal are Permanently Directed Backwards 192

The Hind Limbs of a Sea-lion can be Turned Inwards to Form Feet 192

The Sloth that Walks Upside Down . . . 193

The Cape Hyrax, a Creature with Suckers on its Feet 193

The Gurnard—a Fish that can Walk . . . 208

The Viper or Adder—the only British Poisonous Snake 208

Indian Cobras—one of the Deadliest Species of Snakes 209

The Puff-adder—its Venom is Used for Poisoning Arrow-tips 209

TO FACE PAGE

The Heloderm—the only Poisonous Lizard . . 224

The Tarantula, a Poisonous Spider from Southern Europe 224

The 'Pop-eyed' Goldfish, with Enormous Protruding Eyes 225

The Veil-tailed Goldfish, a Beautiful Variety . . 225

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CHAPTER I

ANIMALS WHICH SHAM DEATH

EVERY animal which populates the earth has to fight against numerous perils that beset its path throughout life in order to claim the right to live, and although Nature has given each one at least some power of defence against its enemies, yet it remains with the individual to make the most of its endowments, and to work out its own salvation.

Of the many methods made use of by the members of the Animal Kingdom to outwit their foes, that of *shamming death* is probably the most remarkable, and although such behaviour may be merely the outcome of an instinct handed down from generation to generation, and cannot be regarded as revealing any special mental power of those creatures which indulge in that means of deception, yet, nevertheless, one cannot ignore the fact that the habit certainly

suggests a reasoning power that connects the action with the hoped-for result.

It is difficult to define the limits which separate instinct from reasoning power, but we know that the former is inborn and inherited, whereas mental capabilities are the result of gradual development.

If the habit of feigning death were confined merely to the higher types of animals, we might be excused for assuming that the practice was largely governed by reasoning power; but as certain species of the lower vertebrates, such as toads, frogs and snakes, indulge in that means of self-protection, it is impossible to regard their habits as arising from mental ability; for not even the most pronounced animal-lover could claim for such creatures a very high degree of brain power.

Among the more remarkable of the batrachians which sham death in order to deceive their foes are the fire-bellied and the closely allied yellow-bellied toads. Both species are inhabitants of Europe, the distribution of the former being confined to certain districts of Russia, Denmark, Sweden, Germany, Austria and Hungary, while the latter ranges from the north of Brittany to the south of Greece. As their names imply, the ventral surface of their bodies is decorated respectively with bright orange or yellow pigments which are exposed to view when the toads feign death. The creatures are said to be very unpalatable, and other animals quickly learn to realise the significance of the *warning colours* so conspicuously displayed, and,

when in search of food, pass on to look out for more toothsome morsels.

When shamming death, these toads contort their bodies in the most remarkable manner, thrusting back their heads as far as possible, raising their fore-limbs with the digits pointing inwards and the elbows outwards, and throwing their hind-legs over on to their backs so that the feet are poised uppermost. In this extraordinary pose they remain motionless until they consider that all danger is past, when they assume once again a normal attitude.

Amongst frogs, that known as Darwin's frog is an adept at feigning death, although it does not tie itself up into a knot in the manner of the foregoing species, but lies motionless upon its back with its legs stretched out in a limp and lifeless condition.

Inhabiting Chile, this frog was first discovered by Darwin during his famous voyage in the *Beagle*. It is a tiny creature, and only attains to a length of about an inch when fully grown; while its nose is very pointed, and ends in a small fleshy prominence.

Apart from its habit of feigning death, Darwin's frog is remarkable also for the manner in which the male looks after the eggs laid by the female. These are conveyed by the former into his mouth, from whence they pass into his throat-sac which extends for a considerable distance beneath his body, and forms a chamber or pouch wherein the eggs undergo their transformation. In due course the tadpoles, which are without gills, emerge from their parent's pouch and make their way

into the unknown world by wriggling out of his mouth.

Of the numerous species of snakes which populate the earth, that known as the American hog-nosed snake is an expert in the practice of feigning death. It is a small species, rarely exceeding three and a half feet in length, and is remarkable for its curious up-turned and shovel-like snout, which serves it in good stead when burrowing.

In spite of the fact that it is quite harmless, and seldom bites a human being, no matter how much it may be provoked, the natives of its habitat regard it as being poisonous. This belief is due, doubtless, to the habits of the reptile, for, when alarmed, it does its best to disguise itself as a venomous cobra by raising its head and expanding the skin folds of its neck, accompanying the action by hissing vigorously.

Should these tactics prove unsuccessful, it then shams death as a last resource, writhing its body about as if it were in convulsions, and, finally, rolling over upon its back and remaining motionless.

Not long since the writer was photographing one of these snakes at the London Zoological Gardens, and the reptile kindly went through its entire performance of deceit, with the result that he was able to obtain the accompanying illustrations. During its final efforts it reposed upon the ground in graceful and limp coils, and, when picked up, hung like a rag in his hand.

Mr. R. L. Ditmars, curator of reptiles at the New York Zoological Park, in his book *Reptiles of*

the World, tells a very amusing tale in reference to one of these snakes. When engaged in a collecting expedition, he came across a specimen, and, finding the natives were terrified at the sight of the creature, he thought it would be a good opportunity to make an impression upon them by causing it to *die* without touching it. Commanding his followers to form up in a circle around him, he proceeded to pass his hands backwards and forwards over the snake, thereby frightening the reptile and inducing it to roll over upon its back, in which position it remained motionless. He then handed round the snake for inspection, and, having satisfied his followers that it was quite dead, said he would bring it back to life again provided they remained perfectly quiet for a few minutes. The snake, mistaking the quietude for the disappearance of its tormentor, then promptly righted itself and commenced to crawl away; but the result of the experiment did not prove so satisfactory as might have been expected, for, to give it in Mr. Ditmars' own words, '. . . the effect was too pronounced. His assistants at once decided his powers of black art suspiciously dangerous. They dropped away one by one.'

A keeper at the London Zoological Gardens once told the writer a curious story regarding a rattlesnake. Thinking the creature to be dead, he removed it from its cage and put it on one side, but, later on, when a visit of inspection was made, the reptile was nowhere to be seen. It had *come to life again* and crawled off to a hiding-place, where,

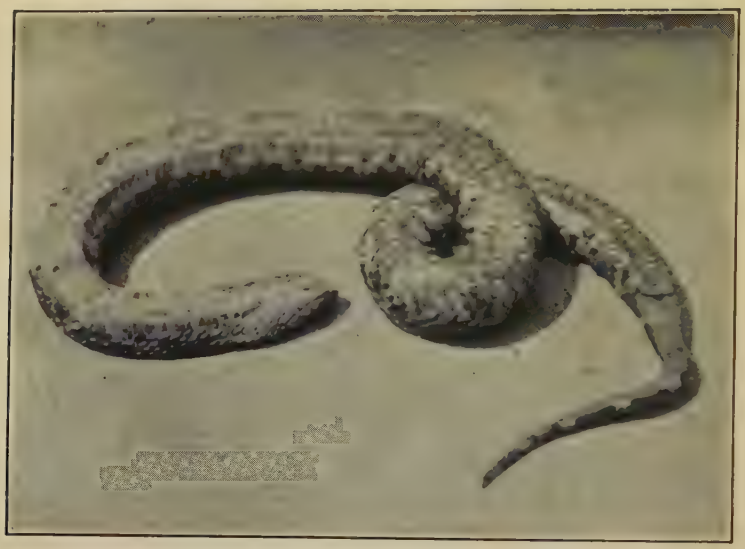
happily, it was found shortly afterwards. Whether the incident was a case of deception on the snake's part or not, it is difficult to say.

Passing to the lizards, we find that although the majority are well able to elude their enemies by relying upon their activity and speed of foot, yet one species, known in the scientific world as *Proctotretus mullimaculatus*, possesses such short legs that it is unable to run quickly, and, when captured or frightened, it feigns death by closing its eyes, stretching out its legs, and flattening out its body.

Amongst mammals, the Australian dingo dog and the American opossum are notorious for their habits of feigning death; indeed, the expression 'to play opossum' is quite proverbial. No more remarkable instances of this trait in the former animal can be cited than those given by George Bennet in his book *Wanderings in New South Wales*, in which the author states:—'The cunning displayed by these animals, and the agony they can endure, without evincing the usual effects of pain, would seem almost incredible, had it not been related by those on whose testimony every dependence can be placed.' An account is given of a dingo being beaten so severely that it was supposed that all its ribs had been broken, but when its captor walked away, the victim was seen to slink off. On another occasion a 'dead' dingo was brought into a hut to be skinned; and, without entering into too many details, it may be stated that the animal displayed such endurance in its endeavours to pass itself off as a defunct creature that it actually

A FIRE-BELLIED TOAD SHAMMING DEATH. [*Page* 20.]

A HOG-NOSED SNAKE POSING AS A COBRA. [*Page* 22.]



A HOG-NOSED SNAKE SHAMMING DEATH. [Page 22.]

A DINGO DOG. [Page 24.]

suffered a portion of the skin of its face to be removed before it gave any signs of life. This incident, horrible though it be to relate, is a wonderful illustration of the extent to which an animal will suffer with a view to its self-preservation ; and in the case of a creature of such a high mental development as a dog, there can be little doubt that the instinct which teaches it in the first place to resort to such a practice is augmented and rendered more efficient by a reasoning power which enables it to look ahead and to gauge the result of its actions.

The American opossum is equally proficient in feigning death, and, when captured, will suffer itself to be beaten without giving any signs of life, even carrying its deception to such a high pitch of perfection as to lie with its tongue protruding from its mouth.

The fox-like animal of South America, known as Azara's dog, is also addicted to the death-feigning practice. Mr. Hudson, in his well-known book *The Naturalist in La Plata,* tells us that :—' When a fox ' (the popular name of the animal in its native country) ' is caught in a trap or run down by dogs he fights savagely at first, but by-and-by relaxes his efforts, drops on the ground, and apparently yields up the ghost. The deception is so well carried out, that dogs are constantly taken in by it, and no one, not previously acquainted with this clever trickery of nature, but would at once pronounce the creature dead, and worthy of some praise for having perished in so brave a spirit.' If,

however, a close observation is made of the animal, it will be seen to open slightly one eye and cautiously take a peep to see if the coast is clear. Should it satisfy itself that such is the case, it then raises its head, take a more thorough look around, and, if the opportunity arises, bolts off as fast as possible. That the creature will undergo a considerable amount of suffering rather than exhibit signs of life has been proved on many occasions, and the authority previously quoted states :—'. . . . I have seen gauchos, who are very cruel to animals, practise the most barbarous experiments on a captive fox without being able to rouse it. . . .'

Hailing from Australia is an animal known as the cuscus, which shams death when captured; while, moreover, it is so tenacious of life that it will continue to live for hours after a charge of shot has entered its body, and even broken its spine or pierced its brain.

We learn also from the writings of Sir Stamford Raffles that a certain species of mouse-deer or chevrotain, known by the natives as the *kanchil*, is in the habit of feigning death when made a captive. Indeed, this trait in its character is so pronounced that the expression 'as cunning as a kanchil' is commonly made use of by the populace to designate a deceitful person.

The kanchil is the smallest of the chevrotains and, with the exception of the royal antelope of West Africa, is also the smallest of all ruminants. Found in Java, Sumatra, Borneo, the Malay Peninsula, as well as in Cochin China and South Tenas-

serim, this tiny creature is little larger than a wild rabbit. The prevailing colour of its coat is of a bright rufous tint, but the under parts of the body are white, and the throat is decorated with streaks of brown and white.

In the fairy stories of the Malay natives, the kanchil is represented as an example of a weak, defenceless but cunning creature that is able to outwit its larger and stronger foes by means of its superior brain power. It has even been reported in all seriousness that the animal, when chased by dogs, will take an upward leap towards a branch of a tree, from which it will remain suspended by its projecting tusks until its persecutors have departed. We do not care, however, to vouch for the veracity of this statement.

Although the chevrotains are regarded as having arisen from the same ancestral stock as the deer, and were formerly grouped in zoological classification with the musk-deer, owing to the males possessing projecting tusks of a similar nature to those of the latter creature, yet further investigation has revealed several peculiarities in their internal structure which entitles them to rank as a distinct family.

The true chevrotains, of which there are five species, are all inhabitants of Asia, their range extending through India, the Malay Archipelago, and the Philippines. The Indian species (*Tragulus memmina*) is readily distinguished from all others on account of its coat being decorated with white spots, while the Malay chevrotain (*Tragulus napu*) claims

the distinction of being the largest of all. The kanchil, as previously stated, is the smallest variety, and another, known as Stanley's chevrotain, is of intermediate size. The last of the genus, namely the Philippine chevrotain, is only found in the islands from which the animal receives its name.

In addition to the above, there remains to be mentioned the water-chevrotain, which differs from the true chevrotains in several particulars. It is an inhabitant of West Africa, and the sole representative of its genus.

A very remarkable story is related by a lady in reference to a pet diana monkey which was journeying on board ship. Like the majority of its kind, the animal was inclined to be mischievous and would frequently steal the sailors' handkerchiefs, caps, etc., and throw them into the sea. Such unseemly behaviour could not pass unreproved, and as a means of punishment, the creature was grasped by the tail, carried off, and held dangling by that member before the cage of a leopard which happened to be a passenger on the same ship.

After this performance had taken place on several occasions, the monkey learned what to expect when he misbehaved himself, and, thinking probably that a dead animal was likely to prove less attractive to the leopard than a live one, he would hold himself rigid, and close his eyes as if he had given up the ghost. Not until he had been removed out of sight of his dreaded enemy would he condescend to come to life again.

One would hardly expect an elephant to indulge

in the practice of feigning death, but a case has been reported of a newly-caught individual, when being led from a corral between two tame ones, suddenly falling to the ground and remaining motionless in a death-like manner. All attempts to make it move having failed, orders were given to the men in charge to remove the ropes from its legs; but no sooner had this been done, and its captors proceeded a short distance on their journey, than the creature rose immediately, and trumpeting loudly to celebrate its recovery, bolted off into the forest, where it was quickly lost to view.

Instances of birds feigning death have been recorded by different observers; the land-rail or corn-crake, and the water-rail being proficient in the art. In reference to the former bird, Canon Atkinson writes in *Forty Years in a Moorland Parish*: 'A gentleman's dog catches a land-rail and brings it to his master, unhurt of course, as is the well-trained dog's way, but to all appearance perfectly dead. The dog lays the bird down at his master's feet, and he turns it over with his toe. It simply moves as it is moved, all its limbs limp. Continuing to regard it, however, the man sees an eye open, and he takes it up. The "artful dodger" is quite dead again in a moment, head hanging and dangling, limbs loose, and no sign of life anywhere.' The bird was then placed in its captor's pocket, but showed its objection to being there by 'coming to.' On being removed it again indulged in its efforts to deceive, and was subsequently laid upon the ground and kept under close observation in order to see

what it would do. After an interval of a few minutes, the feathered humbug lifted up its head, took stock of its surroundings, and, judging that the coast was clear, speedily made off.

A very similar story is related in connection with a water-rail which had been picked up one snowy day in what was presumed to be a dazed condition due to exposure. The person who found it took it to his home and laid the bird before a fire in the hopes of resuscitating it, but for ten minutes it remained quite motionless and stiff. After some time had elapsed, however, during which the observer remained quite still, the avian impostor suddenly jumped up without the slightest warning of its having recovered, and commenced to rush about the room in an endeavour to escape.

The spotted tinamou of the pampas regions of America is another bird well versed in the gentle art of deception, for when caught, and after finding it is useless to attempt to escape from the hands of its captor by its own physical exertions, it *gives up the ghost* by dropping its head and indulging in a few gasps. Should the hand which holds the bird release its grasp for an instant, however, the artful creature quickly flies away to join its mates, and, we may well imagine, to gloat over its success in having outwitted mere man.

Many birds if disturbed during nesting-time will pretend to be wounded and endeavour to lead an intruder from the vicinity of their eggs or young by laboriously limping or fluttering away in the opposite direction. The well-known peewit, lapwing

or green-plover is a notable example which resorts to this practice, while the Canadian ruffed grouse and the willow ptarmigan are also stated to indulge in a similar means of deception. Dr. W. L. Ralph tells us that the American ground dove will act in this manner, and in reference to the species, he wrote in the *Nineteenth Century* :—'When one is driven from a nest containing eggs it will drop to the ground as if shot, and will then flutter around as if wounded, to try to draw the persons disturbing it away from the nest. . . .' Then, again, Mr. C. A. Allen writes about a brood of young plumed partridges which he came across in Oregon, as follows :—'The male who had charge of them performed the usual tactics of feigning lameness, and tried his very best to draw my attention from the young. . . .' It is also a well-known fact that wild ducks will sometimes pretend to be lame, and endeavour to entice the disturber of their harmony from the vicinity of their nests.

Even amongst the invertebrates we find examples which feign death ; the wood-louse, for instance, rolling itself up into a ball when disturbed, and remaining motionless until it considers all danger has passed ; while certain caterpillars and spiders will act also in a similar manner.

CHAPTER II

ANIMALS AS PRIZE-FIGHTERS

THE power to fight, or to give battle in defence and offence, is a gift which Nature has bestowed upon the majority of animals; but we find that certain races and individuals develop a taste for combat and strife far exceeding that of the majority of their kind. These born prize-fighters, as they may well be called, are not confined to any special group of creatures, for included amongst their numbers are mammals, birds, fishes, and insects.

From very early days records have been handed down of organised animal fights being held for the purpose of providing sensational exhibitions for the beholders; and although it is pleasing to state that many of the practices which found favour in the past under the name of sport are no longer allowed, yet, nevertheless, if we inquire into the subject, a great deal of interesting information is to be obtained regarding its historical associations, and we obtain also an insight into the curious nature of some of the combatants.

Few of us, for instance, would expect to find

AN AMERICAN OPOSSUM—AN ADEPT AT FEIGNING DEATH. [*Page* 25.]

AZARA'S DOG—AN EXPERT IN THE ART OF DECEPTION. [*Pages* 25 & 26.]

THE LAND-RAIL OR CORN-CRAKE. [*Page* 29.]

A MANTIS OR PRAYING INSECT. [*Page* 33.]

veritable gladiators amongst fishes, but certain species known as fighting-fishes, found in Japan and Siam, exhibit such a pugnacious disposition that when two of them are placed together in a bowl of water they commence to attack one another with great fury. Indeed, this trait in their character is so pronounced that the inhabitants of those parts keep the fishes for the sole purpose of engaging them in fight with those of their neighbours, large sums of money being wagered upon the results of the combats, and, according to reports, the families of their owners being, at times, also staked upon the issue. In Siam it is necessary to obtain a licence from the Government before indulging in the sport, and the revenue received from this source amounts to a considerable sum during the course of a year. The fighting-fishes are quite small, and when fully grown measure about three or four inches in length. Cantor, in his description of the species, writes :—'When the fish is in a state of quiet, its dull colours present nothing remarkable ; but if two be brought together, or if one sees its own image in a looking-glass, the little creature becomes suddenly excited, the raised fin and the whole body shine with metallic colours of dazzling beauty. . . . In this state it makes repeated darts at its real or reflected antagonist.'

The mantes, soothsayers, or praying-insects as they are variously called—the latter term referring to the curious posture they assume when at rest with their fore-legs folded up in front of them in a devotional attitude—are of an even more blood-

thirsty disposition than the fighting-fishes, for not only will they enter unto combat with their kindred, but the victor will often finish up by making a meal of its victim. The Chinese take advantage of the savage nature of these creatures, and arrange fights between them, the insects being caught for that purpose and kept in small bamboo cages until they are required for use, when a pair are then placed in a basin, and goaded into a state of fury by irritating them with straws. As a rule, however, they do not require any inducement to cause them to attack one another, and when once the combat starts it does not cease until one of the insects is vanquished and dead. It is the custom for the people to bet upon the results of the duels, and those mantes which have achieved fame by securing a number of victories over their fellows are much prized by their owners, and are considered to be worth as much as two or three hundred dollars.

The mantis is a very remarkable creature. It possesses an enormous head, triangular in shape, and poised almost at right angles to its neck. The large and flattened fore-legs are very formidable weapons, the under surface of the tibia and fibia (the shanks and thighs) being armed with sharp spines. These interlock in the manner of the jaws of a tooth-trap, and one well-directed snap with these weapons is sufficient to take off the head of an adversary.

The mantis does not chase its victims, but waits patiently until they approach near. It then

stealthily creeps up to within striking distance and makes a sudden pounce upon them.

Some species are brightly coloured and resemble flowers, thereby enticing their prey to their doom.

On the other hand, certain kinds rely upon concealment as a means of capturing their victims, and assume the colour of their surroundings in order to hide their presence. Only living creatures satisfy the voracious appetite of the mantes, such fare as grasshoppers, flies and caterpillars being devoured with relish.

Many curious stories have been related in regard to these insects. According to an old legend, recorded in *Cassell's Natural History* :—'. . . St. Francis Xavier, on seeing a mantis moving slowly along with its fore-legs raised as if in devotion, desired it to sing the praises of God, which it immediately did in a very beautiful canticle.'

We are also told that the Greeks considered it to have supernatural powers, while Mr. J. F. Ward writes :—'In Nubia, the Hottentots regard a mantis with the greatest reverence, and should one alight on an individual he is recognised as selected of heaven, and at once becomes a saint ; but, woe to the native that kills a mantis ; he becomes no longer a skilled hunter, but is ill-fated until the end of his days.'

The Turks and Arabs also regard the creature with a curious degree of respect, believing that it always turns its head towards Mecca.

Mantes are found chiefly in the warmer regions

of the world, but a few species inhabit Southern Europe.

Among the mammalian members of the animal creation, one would hardly expect a sheep to prove a very pugnacious beast, and although the majority of them are of a placid and peaceful nature, yet, in the Indian fighting-sheep or hunia, we have a species which exhibits a very combative disposition. In Nepal it was a common practice to match two of these animals against one another in fight, and occasionally they were even put to combat with some other creature. The rams alone were used for that purpose, and their owners regarded them with great pride and tended them with much care. In reference to these sheep, Mr. Lockwood Kipling writes in his book *Beast and Man in India* :—'A Mohammedan swell going out for a stroll with his fighting-ram makes a picture of foppery not easily surpassed by the sporting "fancy" of the West. The ram is neatly clipped, with a judicious reservation of the salient tufts, tipped with saffron and mauve dye, and besides a large collar of blue beads, it wears a necklace of hawk-bells.'

The sheep use their heads and horns as weapons, and, when fighting, rush at each other from a distance of a dozen yards and meet with a resounding clash as they come into contact. The first blow having been delivered, the combatants then walk backwards to their 'corners' and continue the fray by charging once again, these tactics being repeated until one of the animals gets home a 'knock-out blow.' An instance is recorded of a fighting ram

being matched against a tiger, and so suddenly did the sheep rush upon its foe that it managed to deliver the first blow, which so seriously discomforted its feline antagonist as to result in the death of the latter.

For the earliest records of animal prize-fights we must go back to the days of the Romans, who were known to indulge in the practice as far back as 186 B.C. In the *Life of the Greeks and Romans* we read that Pompeius arranged a fight during which 500 lions, 18 elephants, and 410 other wild animals brought from Africa were employed; while Augustus, in the year 5, A.D. gave an exhibition at the Flaminian Circus, which had been specially flooded with water, when 36 crocodiles were introduced into the arena and ultimately killed. Caligula was responsible also for arranging a fight in which 400 bears and a similar number of African animals were engaged in combat. It was not always, however, that animals were pitted against one another, for criminals and captives were frequently forced into the arena to give battle with wild beasts; while, moreover, hirelings, and gladiators who had received special instruction at schools devoted to the purpose of training them to fight against animals, were also employed. In the Coliseum at Rome, fights between bulls and men (the latter being on foot, and armed with a single weapon in the form of a spear) were organised from time to time, the combats proving of a dangerous nature, and the bulls often getting the best of the encounters.

Cock-fighting, although having its origin in Greece, was another pastime which found much favour with

the Romans, who introduced the sport into this country. Although the birds were so largely employed as a means of gratifying the baser instincts of the population, yet, strange to say, they appear to have been held sacred to numerous deities, amongst whom may be mentioned Apollo, Mercury, and Æsculapius. Brand, in his writings upon the sport, states :—' Cock-fighting was an institution partly religious and partly political at Athens, and was continued there for the purpose of improving the need of valour in the minds of the Athenian youth ' ; while Baily gives the origin of the pastime as follows :—' When Themistocles was marching his army against the Persians, he by the way espying two cocks fighting, caused his army to behold them, and addressed them as follows : " Behold, these do not fight for their household gods, for the monuments of their ancestors, nor for glory, nor for liberty, nor for the safety of their children, but only because the one will not give way unto the other." This so encouraged the Grecians, that they fought strenuously and obtained the victory over the Persians ; upon which cock-fighting was by a particular law ordained to be annually practised by the Athenians.'

Although cock-fighting was prohibited in the reign of Edward III, the sport revived in later years only to be suppressed again, however, by Henry VIII, and later on by Cromwell. It was a favourite pastime in New York in the year 1873, and for many years found favour with the colliers in the North of England.

It is of interest to note that in the reign of James I a cock-pit was built on a portion of the site where Drury Lane Theatre now stands; while another famous cock-pit, known as the Cock-pit Royal, stood in St. James's Park. Henry VIII also erected one at Whitehall, which, of course, was no longer used during his reign after he had put a stop to the practice of cock-fighting.

There is a curious association between cock-fighting and Shrove Tuesday, for on that day it was the custom for the authorities of many public schools to allow their scholars to indulge in the sport, the masters taking a toll from the boys on these occasions, which was known as *cock-penny*. Many curious regulations were connected with cock-fighting, not the least remarkable being the one which stipulated that in the event of a match being arranged for a bet of £5 or more, the birds should wear silver spurs upon their legs instead of the usual steel ones. It appears that the reason for this rule was in order that the combat should last longer than it would otherwise have done had steel spurs been worn (the former metal being softer and less penetrating than the latter), and that the birds might therefore have a better opportunity for displaying their activity and powers of endurance. A great deal of attention was paid to the birds preparatory to a fight, and their diet was regulated in a most scientific fashion so that they might be in the pink of condition on the day of combat. Their plumage was clipped in various ways, the feathers upon the wings being cut so as to give a

rounded contour to those members, the hackle and faddle feathers being shortened, and the curly tail feathers snipped off, as well as a large portion of the vane or fan.

Quails were used also for fighting purposes, both by the Romans and the Chinese. The method of procedure during these combats was to mark a circle upon the ground, within the boundaries of which two birds were placed. When one of the combatants had succeeded in driving its antagonist outside the ring, it was proclaimed the victor, and the owner of the vanquished bird would then hand over his stakes, either in the form of money or, possibly, the quail itself, to the proud possessor of the winning bird.

In former days the natives of Bengal used to train shrikes to fight with one another. The birds were secured around the body by a string or ' brace,' the free end of which was held by the owners. After being placed upon the ground facing each other, each feathered prize-fighter would then commence to attack its antagonist with great fury, pecking and tearing with bill and talons, and continuing the fray until one of them fell mortally wounded. We are even told that in certain parts of India it was the custom to teach and employ these birds to pounce upon and carry off the metal ornaments from the head-dresses of the wealthy ladies as they promenaded through the streets.

Another custom which was greatly in vogue in days gone by was that of baiting bears with dogs. It was a favourite sport in London during the twelfth

century, and notwithstanding that King Edward proclaimed it ' a dishonest, trivial and useless game,' the practice increased rather than diminished in later years. It is recorded that Queen Elizabeth gave a reception at Kenilworth Castle on July 14th, 1575, at which the Earl of Leicester, her favourite minister, was present, when combats between bears and ban dogs (a small breed of mastiff) took place. Bear-gardens were established in various parts of London, and a notable one was situated at Bankside, Southwark. From an account given in *Chambers' Book of Days*, we are told that the public were admitted into the Gardens at the charge of one penny, a further penny being due at the entry of the ' scaffold ' (a somewhat suggestive term), and a toll of a like sum being taken from those spectators who required ' quiet standing,' or as we should probably describe it nowadays, a ' reserved enclosure.' The sport was upheld by the authorities, and was regarded as far more important than other forms of amusement ; so much so, indeed, that an order was issued to make it an illegal practice to act plays on a Thursday because it was customary for the populace to patronise the bear-gardens on that day.

An equally brutal form of amusement was that of bull-baiting with dogs, a practice which was largely indulged in as far back as the reign of John. It was not until the year 1835 that a law was passed that made it illegal to keep an establishment for the purpose of baiting any animal. The method of conducting bull-baiting was to tie a rope around

the base of the creature's horns, and to attach the free end to a large iron ring which was fixed firmly in the ground. In order that the bull's horns should not damage the dogs, it was the custom to cover them with wooden sheaths. Bull rings are still to be seen in various places, and many of my readers may be familiar with the one which is situated in the High Street at Brading, Isle of Wight.

A somewhat similar sport to bull-baiting was that of bull-running; but from all accounts the practice was only indulged in on one day of the year, namely, that which happened to be exactly six weeks before Christmas Day. The local butcher supplied a bull for the purpose of the sport, and on the morning chosen for the baiting of the unfortunate creature the town crier would parade the streets and order everybody to close their gates and doors, and announce that no one, when chasing the bull, was to make use of a club or staff which was tipped with iron. Everything having been prepared, the bull was let loose into the streets, and the people and their dogs would then commence to chase the animal, working themselves up into such a state of excitement that, as one writer expresses himself: 'One would think them to be so many Furies started out from Hell.'

That these brutal forms of amusement must have had a very injurious effect upon those who took part in them there can be no doubt; and although we are able to say at the present day that such practices are no longer allowed, yet, nevertheless, much remains to be done in order to ensure that

the lower creatures receive the humane treatment which is due to them, and it is to be hoped that the so-called sport of bull-fighting, which is still a national form of amusement in Spain, will soon be but a memory of the past.

The animals used in bull-fighting are a distinct breed which, since the thirteenth century, has been specially reared by careful selection with a view to producing a stock of cattle possessing the qualities of speed, endurance, and courage to a marked degree. Mr. Philip Larcon, in an interesting article upon the Spanish fighting-bull, states :—' To trace the rise of bull-fighting in the Peninsula we must go back to the eighth century, when the Christian knights adopted the custom from their Moorish conquerors. It was the habit of these latter to maintain their skill in arms and to train their sons to war by baiting the wild bulls which roamed free on the vast and uncultivated plains of Iberia.' In those days, however, bull-fighting was very different to what it is at the present day, and was purely a test of skill and agility between man and beast, and lacked the glitter, organised and bloody sensationalism, and sheer brutality which nowadays robs the practice of any right that it might have had in the past to be classified as a sport. The education of the bulls destined for fighting commences when they are a year old, and those which show signs of cowardice are promptly sold and frequently pass the rest of their lives pulling the plough ; but those animals which prove to be courageous remain at the farm for another year, when they

once again undergo a process of elimination, the selected ones being allowed to run wild until they are between five and eight years old, at which age they are considered fit to enter the ring. One by one their turn comes to face the ordeal for which they have been prepared. Amidst the applause of the public they enter the arena, and, with a courage worthy of a better cause, the noble beasts give their lives for the amusement of the spectators.

CHAPTER III

SOME CURIOUS DOMESTIC SHEEP OF FOREIGN LANDS

FEW animals are more valuable to man than the sheep. Its flesh serves as food, the milk of the ewes is utilised in some countries for drinking and for making into cheese, and its hoofs and horns are converted into glue. The woollen industry is almost entirely dependent upon the fleece of sheep for its raw material, and the fur known as 'Astrakhan' is obtained from certain of the Asiatic breeds. Russian tallow is also a product obtained from these animals, while parchment is prepared from their skins, or from those of goats. Sheep are used even as beasts of burden in Tibet, being employed for carrying borax and salt across the mountainous passes of that country, and, according to the account given by Dr. Hooker in *Himalayan Journals*, 'Each carried upwards of forty pounds of salt, done up into two leather bags, slung on either side, and secured by a band going over the chest, and another round the loins, so that they cannot slip off when going up or down hill. These sheep are very tame, patient creatures, travelling twelve miles a day

with great ease, and being indifferent to rocky ground.'

With the exception of some tropical breeds, the domestic sheep differ from their wild brethren by the possession of a woolly instead of a hairy coat, and in some varieties the wool grows upon the animal's legs and face.

The origin of domestic sheep is unknown, but authorities are now generally agreed upon the assumption that they have arisen from a number of wild types, of which the mouflon (the wild sheep of Corsica and Sardinia) and the Asiatic urial or sha were the main factors. One of the earliest records of domestic sheep is of a breed kept by the prehistoric Swiss lake-dwellers, which were of small size and possessed goat-like horns.

As a wool producer, by far the most valuable of all sheep are the merinos, supplying as they do the bulk of the world's wool produce. Originally a native of Spain, the animals were introduced into Hungary by the Empress Maria Theresa in the year 1775, since when they have spread over the greater part of the globe. They were imported first into England during the reign of King George III, when a small number were placed at the royal farm at Kew. They did not prove a great success, however, and found little favour with the English sheep breeders on account of their failing to respond to the usual fattening treatment, no matter how well they were fed. At one time the exportation of merino sheep from Spain was strictly prohibited, except with the special permission of the King;

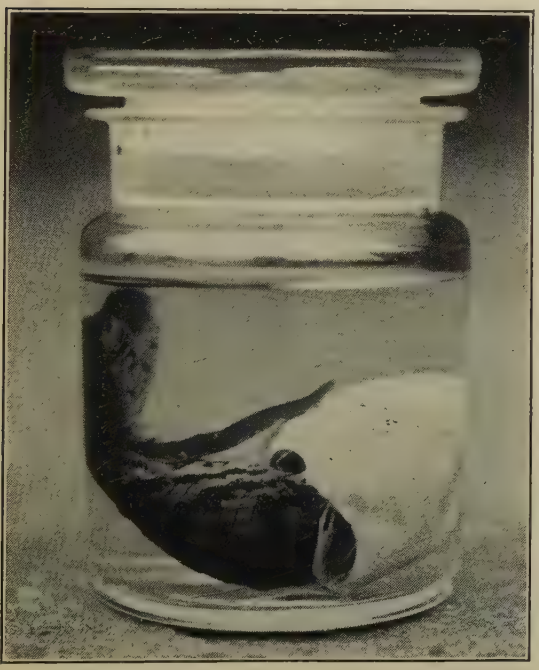
but in time the flocks in that country multiplied to such an extent that the yield of wool became greater than the populace could turn to account, so a sale of the surplus animals was held. It is recorded that King Louis XVI took advantage of this opportunity to secure a herd, and established a merino farm at the village of Rambouillet, situated about forty miles to the west of Paris. The flock was managed so skilfully that, in the course of time, the animals improved to such an extent both in size and wool-bearing qualities as to receive the nickname of 'elephant sheep.' Descendants of this Rambouillet herd are now to be found in many parts of the world, and large flocks are to be met with in Australia, New Zealand, South Africa, South America, and the United States.

Both sexes of wild sheep possess horns, but selective breeding of domestic sheep has resulted in the production of varieties some of which are hornless, whilst others possess two, three, or even as many as six of those appendages.

Few domestic sheep are more remarkable, or have given rise to more controversy, than the Indian one-horned or unicorn-sheep, of which the first living specimens ever seen in this country formed part of a large collection of Nepalese animals presented to King George V, when Prince of Wales, that were exhibited at the London Zoological Gardens in the year 1906. Although receiving the name of unicorn sheep, these animals really possess a pair of horns, for if we examine one of their skulls and remove the horn-sheath from its bony support, it will be

noticed that the latter is composed of two quite separate structures. The sheath itself, however, is united externally along its inner margin for the greater part of its length, but, diverging at its extremity, finally forms two distinct points; while, moreover, a thin horny partition divides the interior of the sheath into two portions. The horns of these sheep take a bold backward sweep from their bases, and, in some cases, their curvature is so pronounced that it is necessary to saw off the tips in order to prevent them from piercing the backs of the animals' necks. There appears to be a certain amount of mystery regarding the origin of these creatures, and some doubt as to whether their peculiar horn-formation is not the outcome of artificial manipulation. Some interesting correspondence was published in the *Field* concerning this question, and in the issue of that paper dated April 27, 1911, the following extract from a letter sent to the late Mr. R. Lydekker by Colonel J. Manners-Smith, British Resident at the Court of Nepal, was published :—' The enquiries which have been kindly made for me by his Excellency the Prime Minister of Nepal, Maharaja Sir Chandra Shrim Shere Jang, have resulted in a clearing up of the mystery attaining to these curiosities. There is no special breed of one-horned sheep in Nepal, nor are the specimens which have been brought here for sale natural freaks. By certain maltreatment, which is described below, ordinary two-horned sheep are converted into a one-horned variety. The process adopted is branding with a red-hot iron

A UNICORN SHEEP—A DOMESTIC BREED FROM NEPAL. [*Page* 47.]



A YOUNG ALLIGATOR EMERGING FROM ITS EGG. (SPIRIT SPECIMEN.)

[*Page* 64.]

SOME CURIOUS EGGS. [*Page* 65.]

LEFT TO RIGHT: 1. ELEPHANTINE TORTOISE. 2. HEN'S EGG. 3. ALGERIAN TORTOISE. 4. SNAPPING TURTLE.

PERCH SPAWN—IT RESEMBLES A PIECE OF LACE.

[*Page* 69.]

the male lambs when about two or three months old on their horns when they are beginning to sprout. The wounds are treated with a mixture of oil and soot, and when they heal, instead of growing at their usual places and spreading, come out as one from the middle of the skull. The breed which appears to be used for the purpose of manipulating and converting into "unicorns" seems to be exclusively the barwal, a Tibetan breed of heavy-horned sheep. . . . I am told that the object of producing these curiosities is to obtain fancy prices for them from the wealthy people in Nepal.' Notwithstanding the above explanation, the majority of naturalists are inclined to doubt whether a true understanding has even yet been arrived at concerning these sheep, for it has been pointed out that the mere fact of searing the budding horns of the lambs would not result in those appendages sprouting out at the summit of the skull instead of towards the side, and, moreover, if there is any secret attending their production, it has been remarkably well kept from the ever-prying eyes of zoologists. It is true that the horns of a young animal might be induced to grow together by binding them up, but in that case we should expect the bony supports to be bent aside at their bases as a result of the unnatural strain put upon them, whereas, on the contrary, those of the unicorn sheep arise in quite a straight manner from the skull.

As previously mentioned, certain sheep show a tendency to grow more than two horns, as many as six sometimes being present. Examples of these

many-horned sheep are to be met with in Iceland, the Isle of Man, and the Shetland Isles; and, according to Mr. Lydekker, it is the custom in the former region for the shepherds to pluck the fleece of the animals instead of shearing it, this being done during the latter part of the year, when the sheep are about to shed their coats. Sheep with extra horns are to be met with also in India, and several specimens, some of which had three horns, and others four, were exhibited at the London Zoological Gardens during the summer of 1906. That these many-horned sheep had their origin in a two-horned breed is indicated by a head shown in the gallery devoted to domestic animals at the British Museum (Natural History), which carries a pair of horns of normal growth throughout the greater part of their length, but each dividing into two separate points from a distance of some eight or ten inches from their extremities.

Very remarkable horns are those of the Wallachian sheep, which are closely twisted like a corkscrew, and resemble those of the Himalayan wild sheep or markhoor. Both sexes possess these appendages, but those of the ewes are much smaller than those of the rams. The fleece of the Wallachian sheep is made into blankets; and their skins, with the wool attached, are utilised largely by the shepherds and peasants of Wallachia and Hungary for clothing.

In the fat-tailed and fat-rumped sheep we have some curious types which are characterised by the great development of their caudal appendages.

The fat-rumped sheep are found in the Himalayas, Syria, Palestine, Persia, Astrakhan, etc., and those from the latter region supply the well-known Astrakhan fur; whilst the product known in the fur trade as 'Persian lamb' is obtained from the Persian breed. The range of the Persian fat-rumped sheep extends also into India, in which country they receive the name of *dumba-wala*, meaning 'the sheep with a big tail.' When viewed from behind, the tails of these animals (which swell out on either side into enormous cushion-like masses, and weigh at times as much as forty pounds) completely hide their hind-quarters, so much so, indeed, that they might easily be mistaken for that portion of their anatomy. If, however, a tightly-stretched cloth be placed underneath and behind the tail, the full extent of that member is revealed.

Astrakhan and Persian lamb fur, it may be mentioned, is the tightly-curled baby coats of the newly-born lambs; and as their fleece only remains in the approved curly state for a few days after they have been born, numbers of lambs are slaughtered at that innocent age in order to supply the demands of the fashionable world. It is pleasing to be able to state, however, that there is no truth in the report one hears from time to time of the ewes being killed for the sake of procuring the skins of their unborn offspring. Canon Tristam, in his book *Natural History of the Bible*, says that these broad-tailed sheep were known in the days of Herodotus and Aristotle. He further states: 'The tail is simply a mass of fat, and is used for grease, for lamps,

and for cooking. The Arabs fry it in slices and esteem it a delicacy, but it is very like fried tallow.'

In the African fat-tailed sheep we have another species which stores up an accumulation of fat in its caudal appendage, this member being of considerable length, and, in some individuals, even trailing upon the ground. A specimen from Egypt has been recorded which had a tail weighing as much as eighty pounds. According to report it is by no means an uncommon practice for the shepherds to construct little two-wheeled carriages to place under the end of the sheep's tails in order to give support and to prevent them from chafing upon the earth, but we do not care to vouch for the veracity of this statement.

Although selective breeding has produced domestic sheep with abnormally developed tails, yet it is interesting to note that an accumulation of fat in that part of an animal's anatomy is by no means an uncommon feature with other wild creatures. The fat-tailed desert-mouse and the heloderm lizard, for instance, both store up a large amount of fat in their tails, which serves as a reserve of nourishment that the animals can absorb into their systems, and thus sustain life during times when food is scarce.

A breed of sheep of quite a different character to any we have so far reviewed are those kept by the Hausa tribe of Nigeria. They present many goat-like features, inasmuch as their bodies are clothed in hair instead of wool; while, moreover, their ears are long and pendant, and frequently a pair of small tags or wattles are present upon their throats. The

ewes are without horns, but the rams carry fine spirally-twisted pairs which spread outwards on either side of their heads. Both sexes are characterised by the unusual length of their tails and legs, and also by their pronounced 'Roman noses,' while some individuals possess a long mane upon their neck and chest.

Shanghai is the home of a remarkable breed of sheep which possess no external ears. Their fleece is entirely white, and neither sex has horns. The only living specimens ever seen in this country were a small flock which H.R.H. Prince Albert, H.M. Vice-Consul at Shanghai, presented to the London Zoological Society in April, 1855. These sheep are extraordinarily prolific, and Mr. A. D. Bartlett, the Superintendent of the Gardens at that time, recorded the fact that they bred twice a year, and the ewes frequently produced as many as five lambs at a birth. During the spring of 1857, three of the ewes at the Zoological Gardens had no less than thirteen lambs.

CHAPTER IV

CONCERNING EGGS AND THOSE THAT LAY THEM

IT is surprising how many different kinds of creatures originate from eggs; indeed, it is no exaggeration to say that the majority of them come into the world in that form. All birds are hatched therefrom, and the myriad of insects which inhabit the universe are produced in a like manner; although, it must be mentioned, the aphides reproduce their kind also by the process known as 'budding.' Crocodiles, alligators, tortoises, turtles, frogs, toads, newts, and the various forms of crustaceans all owe their existence to eggs which are laid by the females, as do also the lizards, fishes, and snakes. In certain cases, however, the young are hatched out before the eggs from which they originate see the light of day. Even amongst the mammals we have examples in the echidnas or spiny ant-eaters, and the platypus or duckbill, which hatch out their young from eggs.

Although one commonly speaks of an oval-shaped object as being 'egg-shaped,' yet, strictly speaking,

the expression is not altogether a correct one, for not all eggs are of that form. The ova of the female thorn moth, for instance, are rectangular in shape, and, when laid, are arranged side by side like a row of bricks ; whilst those of the stick-insects resemble miniature flasks with a small lid at the top. It is true that the majority of birds' eggs are of an oval form, but those of the guillemots and other members of the auk family prove an exception to the general rule and are cone-shaped, the one end being considerably larger than the other. As these are deposited by the birds upon the ledges of high precipitous cliffs without any nest being made, their unusual form serves a very useful purpose, for should they accidentally be disturbed by the movements of their owners, or by the force of the wind, they pivot round and round in a circle upon their apexes, instead of rolling in a more or less straight line which, in all probability, would result in their falling from their resting places and being broken to atoms. Guillemot eggs are very remarkable for their varied tints and markings, and, to quote the writings of Mr. Seebohm, '. . . the ground-colours are cream, white, blue, and yellowish-green, dark and clear pea-green, and reddish and purplish brown, with every conceivable intermediate tint. Some are irregularly blotched, others are fantastically streaked with browns, pinks, or greys in endless variety, whilst a few are spotless or nearly so.'

By far the most beautiful of all eggs are those laid by birds, many of them being very prettily

coloured and marked, whilst those of the tinamou or Argentine partridge are so highly glazed as to have the appearance of being varnished. Mention must be made of the flightless apteryx or kiwi of New Zealand, a bird not so large as a domestic hen, which is unique on account of the enormous size of the eggs laid by the female, these frequently measuring five inches or more in length.

As previously stated, the egg-laying mammals are represented by the platypus and the echidnas. They belong to a sub-order of the Marsupialia (classified as the lowest of the Mammalia), and are curious in the fact that they do not possess any teeth when adult. In the young of the former, however, horny and tubular teeth are present which gradually wear away and are eventually replaced by horny plates, a fact which zoologists regard as proving that the ancestors of the creature were originally provided with a permanent set. In addition to the horny plates situated upon the jaws, the adult platypus also possesses a series of transverse ridges upon the palate which are similar to those found in ducks ; while in the echidna, small spines, which slope backwards and serve to guide the animal's food towards its throat, are attached to the tongue and palate. The platypus, formerly fairly plentiful in certain parts of Southern and Eastern Australia, but now extremely rare, attains to a length of about twenty inches, and is clothed in a somewhat thick fur suggesting that of a mole. Its flat and duck-like beak is rounded in front, and

the nostrils are situated at the extremity of that organ. All the feet are furnished with webs ; those upon the fore-feet, which extend beyond the claws and serve as admirable paddles when the creature is swimming, being partly folded back when it is engaged in burrowing. Although it has for long been known that the female echidna hatches out its young from eggs which she has deposited, yet there appears to have been some doubt as to whether the ova of the female platypus were actually laid by the parent or not. But any uncertainty regarding this question no longer exists, Professor Wilson having proved conclusively by the discovery of some eggs, models of which can be seen in the Mammal gallery at the Natural History Museum, London, that she really does so.

The home of the platypus is excavated out of the bank of a river. Two entrances are usually made, one of which is situated under the water and the other about two feet above the water-level—the latter being carefully concealed amidst long grass and other foliage. These entrances lead to long passages which run obliquely upwards in the river bank and sometimes extend for a distance of fifty feet. They terminate in an expanded chamber measuring about a foot or more in length and six inches in width. During the breeding season a nest is constructed within this domicile, composed chiefly of blue gum leaves.

The young are both blind and naked when first born, and their bills are very much shorter in comparison to those of their parents,

The Australian aborigines, who are very partial to the flesh of a young platypus, call it by the name of *Mullingong* or *Tambreet*, while the colonists speak of it as the water-mole. The natives capture the creatures as they repose in their burrows, first of all making sure that they are at home by carefully examining the footprints around the domicile. If these appear to be newly formed, the hunters then drive sticks into the ground at intervals of a few feet apart, thereby tracing the direction of the underground passage to the terminating chamber wherein lie the victims.

Although the platypus has been kept alive in captivity in its native country, no living example has ever been seen in Europe. Mr. Bennett gives an interesting account of a pair of young ones he caught and kept for a period of five weeks. He describes them as being 'as frolicsome as puppies, and apparently as fond of play; and many of their actions were not a little ludicrous. They climbed up with great readiness to the summit of a book-case, and this by means of the strong cutaneous muscles of their claws, mounting with much expedition to the top. Their food consisted of bread soaked in water, chopped eggs, and meat minced very small, and they did not seem to prefer milk to water.'

The female platypus lays two eggs at a time which are yellowish in colour and enclosed in a flexible shell about three-quarters of an inch in length.

The eggs resemble those of a bird, inasmuch as

the greater part consists of yolk, only a small portion of which is utilised in the formation of the embryo, the remainder serving as food for the young when they are hatched.

The mother nurses her babies in the usual mammalian manner, but as she does not possess any external nipples, her milk is discharged from her glands through numerous small pores that are arranged in a cup-like cavity or depression situated upon her body.

The adult animals feed upon various forms of insect life, water-snails, shell-fish and worms, for which they probe amidst the mud and sand.

The food, which is collected under water, is stored in cheek pouches which are situated one on either side of the mouth, the creatures rising to the surface in order to devour the repast at leisure.

Chiefly aquatic in habits, the platypus is an expert both at diving and swimming. On land, however, its movements are somewhat ungainly, although it is stated to be able to cover the ground at a fair pace.

The egg-laying mammals known as the echidnas are easily distinguished from the platypus owing to the upper part of their heads and bodies being covered with sharp spines interspersed with wiry hairs.

Their snouts are very narrow and beak-like, and their feet are furnished with large and powerful claws — those upon the hind feet being very

peculiar on account of their being turned backwards.

A horny spur, pierced by a small channel opening at the extremity, from which exudes a fluid discharged from glands situated upon the leg, is present upon the heels of the males. These spurs serve their owners as weapons of offence and defence, while, moreover, the secretion exuded from the glands is of a slightly poisonous nature.

The animal's jaws are devoid of teeth, but the tongue is of great length and proves a most efficient instrument for lapping up the ants upon which it feeds. The short and stump-like tail is hidden by numerous small spines, while similar spines of varying length cover the upper part and sides of the body, the uppermost ones on either side pointing upwards and overlapping one another.

Three distinct races of echidnas are generally recognised, one found at Port Moresby in the south of New Guinea being characterised by its small size (an adult only attaining to a length of a little more than a foot) and by the shortness of its spines.

In the variety that inhabits Australia, the spines are very long, while a third race, confined to the island of Tasmania, is distinguished by its superior size (a length of eighteen inches or more being by no means unusual), and by the fact that its short spines are almost completely concealed by hair.

Mr. Frank Finn tells us that in certain places

the echidna is known as *Nickobejan*, and in other localities it goes by the names of *Jannocumbine* or *Cogera*. He further states: 'They eat it, as they do most things—their method of cooking being to roast it in the skin, and fifty years ago, at any rate, it was considered good eating by our colonial countrymen also.'

Nocturnal in habits, the echidna dwells amidst the sandy districts. During the daytime it lies concealed within a hole underground. It is an expert at burrowing, sinking downwards into the loose soil, not head first, but more in the manner of a tortoise working its way beneath the soil—its powerful claws excavating the sand from beneath its body.

Unlike the platypus which lays two eggs at a time, the female echidna lays but a single one. This is yellowish in colour and may be compared in size to that of a sparrow. After the egg is laid, she places it within her pouch, which is a structure formed by folds of skin that develop a short period before the egg is laid.

The unhatched baby possesses, a small and hard pimple upon the end of its snout of a similar nature to the so-called 'egg-tooth' possessed by young chickens. By pressing and wriggling this against the egg-shell, it manages to break its way out and comes forth into an unknown world.

At first the young echidna is quite small, and its spines are little more than soft and flexible prickles.

These soon harden and grow, however, until at

last the devoted mother feels that she can no longer accommodate her offspring within her pouch with any degree of comfort. She then gives the infant notice to quit, first of all preparing a burrow under the ground wherein it may repose in safety.

Her temporary pouch, having served its purpose, gradually disappears, and does not re-develop until the following year.

The young ones are stated to be born in May, a somewhat curious season considering that that month heralds the approach of the Australian winter.

But as the creatures undergo a period of æstivation during the hottest and driest months of the year, this fact may account for the lateness of the breeding season.

Echidnas thrive well in captivity, and quite a number have been exhibited from time to time at the London Zoological Gardens. Like many other animals, however, they are beginning to get somewhat rare.

Quite distinct from any of the foregoing is a most remarkable animal known as the proechidna (*Proechidna brujnii*), so named from the explorer Brujn, who was the first to discover it.

Unlike the ordinary echidnas which have five toes upon each foot, the proechidna usually possesses but three. Occasionally, however, specimens are found with additional toes in varying stages of development—one animal having been discovered that had five toes on its fore-feet and four on its hind feet.

The proechidna is considerably larger than the ordinary echidnas, an adult measuring over two feet in length. Its body is clothed in rather short and blackish-brown hair which has been likened unto velvet in texture. From this arise a number of short and whitish spines but an inch or two in length, and being very sparsely distributed over the body.

The creature's snout is much longer in proportion to that of the echidnas, and it is also unique in the fact that it curves downwards like the bill of an avocet.

Found in north-west Guinea in the districts of Mount Arfak and Mont des Karous, the proechidna dwells amidst the rocky ground in situations away from the sea at an elevation generally exceeding 3,450 feet. The natives, who know the animal by the name of 'nokdiak,' used to hunt it for the sake of procuring its flesh, but it is very doubtful whether they often get the opportunity of supping upon the creature at the present day owing to its rarity.

Only two living specimens, one of which is still living at the time of writing, have ever been seen in this country. These arrived at the London Zoo in November, 1912.

Of the reptiles which lay eggs, we will take as our first examples the alligators and crocodiles.

During the pairing season the female of the former makes a nest of twigs, reeds, etc., which measures about ten feet across, and is situated a

short distance from the water's edge. Having done so, she then deposits some twenty or thirty eggs therein, covering them up carefully with damp leaves and other decaying vegetation which retains the moisture and generates a considerable amount of heat.

In the course of about eight weeks the young ones hatch out, and a short time previous to this event the baby alligators give voice to loud squeaking sounds as a call to their ever-watchful parents, who then scrape away the outer covering of the nest so as to enable their progeny to crawl away as soon as they emerge from the eggs.

The nesting habits of the crocodiles are very similar to those of the alligators, but differ in the fact that the parents deposit their eggs, from forty to sixty in number, in holes excavated in the sand. In the majority of cases the ova are left to be hatched out entirely by the heat of the sun, but it appears that their owners will sometimes assist in the incubation by reposing upon the tops of the nests. In a similar manner to the alligators, the young crocodiles, when ready for emerging from the eggs, utter sounds to attract the notice of their parents, who dig down to them and prepare an exit from the nests. To assist in their breaking through the egg shell, the infant crocodiles are provided with a small prominence upon the end of their snouts, of a similar nature to that of the echidna. This 'egg-tooth,' having served its purpose, is shed after a period of about two days.

Another member of the crocodile family, known as the garial or gavial, is remarkable on account of the female's habit of depositing her eggs, to a number of about forty, in two layers, which are separated from one another by several feet of sand. The reptile, which is the solitary representative of its genus, grows to a length of almost thirty feet. It is easily distinguished from all other members of the *Crocodilia* owing to the great length and slenderness of its snout, which, in the males, expands at the end into an upstanding swelling. Its long jaws are armed with a formidable array of sharp teeth which serve to secure a firm hold of the fish upon which the creature chiefly feeds.

Although it has been known to attack and devour human beings, yet as a rule it is of a more or less harmless nature. Garials come from India, and are found chiefly in the Ganges and Indus rivers.

Before passing to the tortoises, we may mention that the ova of both the crocodiles and alligators are oval in form, white in colour, and possess hard shells.

Although the members of the tortoise family are oviparous, we find the eggs of the various species (all of which are hard shelled except in the case of the turtles) differ in regard to their shape, some being round, and others oval. They also vary considerably in size, those of the giant tortoises being as large as cricket balls, and those of the smaller kinds sometimes being no larger than acorns. The land tortoises, the water tortoises, and the

marine turtles, all resort to the land for the purpose of laying their eggs. These are usually deposited in a hole excavated out of the soil, and, after being carefully covered up again, are left to hatch out under the influence of the sun's rays. That tortoises are not so unintelligent as they look may be judged by the artifice they employ in order to remove all external traces of their nests, for, with that end in view, they will stamp upon the ground with their feet, and even poise their bodies as high in the air as their short limbs will allow and then drop down suddenly and bring the under surface of their shells into forcible contact with the underlying soil until it is flattened out and rendered as level as the surrounding parts.

Of the vast number of lizards which populate the earth we find that by far the greater majority lay eggs. Some, however, such as our common lizard, the slow-worm, and nearly all of the skinks are viviparous, although, curiously enough, the ocellated sand-skink, which usually brings forth its young in an active condition, has also been known to lay eggs.

In a like manner to the lizards, the snakes reproduce their kind by laying eggs and also by giving birth to living young ones. Those which favour the former method deposit their ova in a heap of decaying vegetation and leave them to be hatched out by the heat which generates therefrom, or else incubate them by coiling their bodies around them. As many as one hundred eggs may be laid at a 'sitting,' according to the species of snake

responsible for their production, these being oval in form, and possessing a tough leathery shell. They are laid one at a time, but owing to their being coated with a sticky secretion, ultimately adhere together into a mass.

In the case of frogs and toads, the eggs of the females are frequently produced in clusters and held together by a jelly-like substance; but at other times only a single one is laid, which is of large size and also enveloped in a gelatinous covering. Mr. E. G. Boulenger gives the following figures in reference to the number of eggs laid by some of the best-known species of frogs and toads: 'Green toad about 11,000, edible frog about 10,000, common toad about 6,000, natterjack about 3,500, common frog about 3,000, agile frog about 1,000, green-tree frog about 900. . . .'

The ova of the common frog and toad are easily distinguished the one from the other inasmuch as those of the former are deposited in large masses which may be seen floating upon the surface of the water in ponds, brooks, and ditches during the months of January, February, and March (according to locality and climatic conditions); while those of the latter are laid in long gelatinous strings, which are entwined around water plants, and remain submerged.

The spawning habits of a species of tree-frog found in tropical America are very remarkable, the females depositing their eggs and enfolding them between the leaves of trees which overhang ponds, leaving but a small opening at the lower

end through which the tadpoles are able to emerge and drop into the water.

It is by no means necessary to visit foreign parts to find curious eggs, for many interesting types are to be met with in this country, especially during a ramble along the sea-shore. There can be few of us who have not, at some time or other, picked up the little sponge-like masses, formed of numerous flattened and roundish capsules, each one containing five or six eggs. These are the egg-cases of the common whelk. Then, again, the eggs of the common sepia or cuttle-fish, which resemble bunches of small black grapes, and feel just as if they were made of indiarubber, are other objects that are often to be found.

The egg-cases of the dog-fish and the skate, frequently spoken of as 'mermaids' purses,' are also to be seen stranded upon the beach; those of the former being oblong and narrow in form, yellow in colour, and possessing long curling tendrils growing from their corners, which, when stretched out to their fullest extent, measure about two feet in length; and those of the latter being dark brown in colour, about half as broad as they are long, and furnished with spike-like projections at their extremities.

Many fishes are remarkable for the number of eggs they produce; to mention but a few examples, it is estimated that a cod's roe weighing 7¾ lbs. would contain about seven million eggs, and that a salmon would yield 1,000 eggs for every pound of its weight; while Mr. Lydekker states that

more than 280,000 eggs have been taken from a perch which weighed but half a pound.

Few objects are more beautiful than perch spawn, which, as shown in the accompanying illustration, is deposited by the female in a long band, and draped over aquatic plants in such a manner that it greatly resembles a piece of fine lace exhibited at a shop. In the majority of cases, when once a fish has laid its eggs, it leaves them to their fate; at other times, however, the parents stand guard over them, or even curl their bodies around them. The habits of the bitterling carp, a small fish which does not grow to a length of more than three inches, are very curious, inasmuch as the female will sometimes deposit her eggs within the shells of fresh-water mussels in order to afford them protection against the unwelcome attentions of those foes who are ever ready to devour them.

Amongst the molluscs, mention must be made of the oyster, which produces enormous quantities of eggs. Concerning this feature, Buckland writes that the spawn or 'spat' as it is called 'resembles very fine slate-pencil dust, and the number of spats in one oyster . . . varies from 829,000 to 276,000 individuals. One fine hot day the mother oyster opens her shell, and the young ones escape from it in a cloud, which may be compared to a puff of steam from a railway engine on a still morning.' The above figures, however, are exceeded by another writer, who states that 'a single individual has been known to produce as many as six million eggs.'

Although snails are such common objects in our

gardens, yet it is not often that one comes across their eggs, on account of their being deposited in holes which the females make in the ground and afterwards fill up again with such skill as to leave no signs of their work. The quantity and size of the eggs laid by these creatures varies considerably according to the species responsible for their production, those of the well-known edible or vine-snail being about the size of a small pea, and somewhat soft and jelly-like in consistency, while in regard to their number, an individual will produce sixty or eighty in the course of a few days. Very different, however, is the case of the giant snails, which lay very few eggs, but of such a large size as to resemble those of a bird, these being oval in form and white in colour. The shells of these giant snails frequently measure as much as six inches in length, and in some countries the creatures themselves are eaten by the populace.

Few eggs are more remarkable than those of certain insects, but their beautiful structure is not always revealed to the eye without the use of a microscope. When magnified, however, by that means, it will be noted that many of them are wonderfully decorated and sculptured, and others look as if they were covered with a network of lace; while those of us who are unacquainted with the ova of the lace-wing fly might readily mistake them for some form of fungus on account of the manner in which they are attached to the leaves or twigs of trees by fine silk-like stalks, about an inch in length.

Not only do the eggs of different species of insects vary considerably the one from the other as regards their colour, some being white, others yellow, others green, others pale blue, and others pink; but a change of tint frequently takes place after they have been laid, and those of my readers who used to keep silkworms will, doubtless, remember that the newly-laid eggs of the silk-moths are pale yellow, and afterwards turn to a violet hue.

The female common gnat is an insect which shows considerable ingenuity in the method of dealing with her eggs, for as its larvæ pass their existence in water, it is necessary for the ova from which they emerge to be deposited close to that element, and, with that end in view, the parent, when laying her eggs, proceeds to build them into a floating raft or boat, which has been likened unto a wherry in shape, the two ends being higher than the sides, and the lower part being convex or keel-shaped in form. The manner in which the tiny insect commences to construct her egg-boat is very remarkable. First of all she settles upon some object floating upon the water, such as a leaf or twig, and then thrusts out her hind legs behind her, and crosses the one over the other. Within the area thus enclosed she begins to lay her eggs, the first one being supported at the junction of her crossed legs, and the other ones being placed in juxtaposition thereto, the eggs being united together by a sticky secretion, until as many as three hundred have been deposited.

Mention must also be made of the lackey moth,

which indulges in the practice of laying her eggs around the twig of a tree in the form of a bracelet, as many as three hundred being glued together in this manner by a hard substance, somewhat resembling varnish, which serves to protect them against the rigour of the weather.

That insects' eggs are capable of withstanding a great degree of cold without resulting in injury to their well-being is proved by experiments that have been made upon them, one writer recording the fact that he enclosed some eggs of the silk-worm moth in a glass receptacle which he placed in a mixture of rock-salt and ice for a period of five hours, when the temperature fell to six degrees below zero. Notwithstanding this severe treatment, the eggs hatched out during the following spring at just the same time as some others which had not been thus treated. The same writer continued his experiments on a subsequent occasion, and put some more eggs to a far more severe test. He states: 'A mixture of ice and rock-salt, with the burning spirit of nitre, reduced the thermometer 22 degrees below zero . . ., or 52 degrees lower than the point at which water freezes. They were not injured, as I had evident proof—by their being hatched.'

The incubation period of eggs varies considerably, in some cases being very rapid, while in others some time elapses before the process is completed. The eggs of the common house-fly, for instance, will, under favourable conditions, hatch out within eight hours after being deposited by the female;

but, on the other hand, those of birds sometimes take a month or more to incubate.

The following list of the incubation periods of some of our well-known British birds' eggs may prove of interest. Our familiar house-sparrow takes sixteen days to hatch her eggs; the wren, nineteen days; the robin and hedge-sparrow, seventeen days, as also does the greenfinch, goldfinch, and chaffinch. The linnet sits for eighteen days; the starling for twenty days; the great-tit, the blue-tit, and the marsh-tit, for twenty days; and their near relative, the long-tailed tit, for twenty-two days. The rook incubates her eggs for twenty-seven days; the water ouzel or dipper, for twenty days; while the peewit or lapwing sits for nineteen days. The eggs of the skylark take eighteen days to hatch; those of the goldcrest, twenty days; those of the thrush, nineteen days; those of the sand-martin eighteen days; and those of the house-martin and swallow, seventeen days. The grey wagtail and pied wagtail sit for seventeen days; and the yellow wagtail for one day more; while the chiffchaff, white-throat, and willow wren sit for eleven days. The jackdaw incubates her eggs for twenty-two days; the meadow and tree pipits, for eighteen days; as also does the yellow bunting or yellow-hammer. The mute swan incubates for forty-two days; the snipe, for twenty days; the ring dove, for eighteen days; the missel-thrush and the blackbird, for twenty days; and the spotted flycatcher and redstart, for eighteen days. Wild ducks sit upon

their eggs for thirty-four days; the red grouse, for about thirty days; the ring ouzel, for eighteen days; the swift, for sixteen days; the moor-hen or water-hen, for twenty-four days; the cuckoo, for thirteen days; and the corn-crake or land-rail, for twenty-eight days.

CHAPTER V

CURIOUS MESSMATES

ALTHOUGH the majority of animals are very clannish in their mode of life, and do not associate with other creatures except of their own kindred, yet certain kinds prove exceptions to the general rule, and seek the society of alien folk. It is true that in many cases such a proceeding is governed solely by selfish interests, but, nevertheless, we find also instances of a real friendship between members of the Animal Kingdom which have no ulterior motives behind them. Then again, on the contrary, there are a vast number of creatures which live in close contact with one another, and between whom no love is lost, but so persistent are the attentions of the unwanted guests that their hosts are quite unable to free themselves from their company, and are forced to accept the inevitable.

We may therefore very well classify animal companionships into three divisions; namely: the true companionship; that governed by mutual benefit, which may be termed indifferent friendship; and, finally, the unavoidable partnership. Under the

first heading are included the many instances which from time to time are recorded of two animals, of quite different species, becoming inseparable companions; and of all strange friendships that the writer has known, none was more remarkable than that between a little Kandt's monkey and a wombat which lived together in perfect harmony at the London Zoological Gardens.

It has often been stated that people of just the opposite dispositions agree with one another far better than those of similar tastes, and, certainly, this theory was fully borne out when applied to the animals in question, for nothing could have been more diametrically opposed than their respective temperaments. The monkey, as might be expected, was of a lively and mischievous disposition, and the wombat was characterised by its solemn and dignified bearing; but notwithstanding this difference, the two creatures never quarrelled, and the wombat was always ready to act as a steed for its companion. Many a 'joy-ride' did the monkey indulge in, as shown in the accompanying illustration.

The wombat, it may be mentioned, is an Australian marsupial, and its name invariably recalls to the writer's memory a certain person who, some years back, astonished the world by an account, which was published in a popular magazine, describing his experiences after he had been shipwrecked and cast upon a desert island. The narrative was full of the most wonderful incidents (all guaranteed to be true), which followed the one after the other in an unbroken sequence; but, alas

the vivid imagination of the author ultimately got out of bounds to the detriment of his claim for veracity, and his fame came to a sudden end through his describing a *flight* of wombats that he had witnessed; for, unfortunately, the wombat, in spite of the last syllable of its name, is not endowed with the power to fly.

It is a well-known fact that animals will often act as foster-mothers to the young of others, and many curious instances of such associations have come under the writer's notice, more especially at the Zoological Gardens, where a number of creatures are born during the course of a year. Wolf and fox cubs are frequently placed in charge of female domestic dogs, who bring them up with their own puppies, and several litters of young polar bears have been mothered by canine foster-parents. On one occasion the calf of a gnu (a species of antelope) was given in charge of a cow, and several years back a domestic cat acted as foster-mother to some young squirrels. Gilbert White mentions an instance of a cat rearing some baby squirrels, and also tells us of another cat which suckled a leveret; while the present writer has seen a young hare and a pair of fledgling blackbirds which dwelt together and were on the most friendly terms with one another.

Amongst the class of animals which we have termed unavoidable companions are the numerous kinds of parasites that are ever ready to attach themselves to the person of almost every living creature, for, to quote the words of De Morgan—

Great fleas have little fleas upon their backs to bite 'em,
And little fleas have lesser fleas, and so *ad infinitum*;
And the great fleas themselves, in turn, have greater fleas to go on,
Whilst these again have greater still, and greater still, and so on.

There are several species of mites which inhabit the nests of ants and attach themselves to the bodies of the rightful inmates, and one kind, which forces its presence upon the black ant, has the remarkable habit of rubbing the mouths of its hosts with its fore-legs, and thereby inducing them to exude drops of fluid upon which to feed. In addition to such interlopers, however, there are other creatures which take up their abode in ants' nests as ever-welcome guests, and a species of beetle (*Claviger testaceus*), found in the British Isles, passes the whole of its existence in company with our yellow ants (*Formica flava*). It is totally blind, and, consequently, entirely dependent upon the ants for receiving a supply of food; but the latter are always ready to render their services in such respect, and in exchange receive a supply of a sweet-tasting fluid, secreted by their guest, which is much appreciated by the ants as an item of their diet. Ants are also very fond of feeding upon the sugary fluid or 'honey-dew' which flows from the intestines of aphides or plant-lice, and, with that end in view, not only will they provide the insects with food, but even secure their eggs and carefully tend them until the young emerge. Mr. Lydekker tells us that: 'Tunnels, or covered

ways, are made by some ants up the branches of the trees where the aphides live, so that the insects are enclosed and kept prisoners. Certain portions of the tunnels are enlarged to form stables, where the aphides are penned, the doors being large enough for the narrow ants to enter and leave, but not for the rotund plant-lice to escape. The 'cows' are induced to part with a drop of honey-dew by a gentle stroking with the antennæ, and general encouragement of other kinds. Ants are far in advance of human dairymaids in the matter of tact in dealing with their cows. Colonies of aphides have been carried by ants to fresh pastures.'

A certain species of ant receives the grubs of a fly as lodgers, but the host does not appear to pay much attention to its strange companions, and, according to reports, will, at times, even attempt to slay them. Mr. Donisthorpe has found as many as twelve of these grubs in an ants' nest in Somersetshire, and he states that should one of them be removed it invariably dies in consequence. At the end of April the grubs assume the chrysalis form, and after a period of about thirty days the perfect fly emerges, which, as soon as its wings are sufficiently dry, then flies away from the home that sheltered it during its previous stage of existence. The female insects, however, ultimately return to the nest, or another one situated in the neighbourhood, in order to lay their eggs therein.

A curious-looking creature, known as the spotted amphisbæna, takes up its abode in the nests of the South American saüba or parasol ants. Accord-

ing to the reports of the natives, the latter evince such a strong affection towards their strange messmate that they will even desert their nest should it be removed, but as there is a strong suspicion that the amphisbæna feeds upon the bodies of its host, the friendship appears to be a somewhat one-sided affair. At a first glance, the amphisbæna appears to be nothing less than a curiously-marked worm, yet, in reality, it is a limbless lizard which has the remarkable power of progressing along the ground in both a forward and backward direction, a circumstance which is responsible for the belief held by the natives that it possesses two heads.

An interesting association between four-footed creatures and birds is that indulged in by the North American prairie dogs or prairie marmots, and the burrowing owls, for where the former make their burrows, there also the owls will be found dwelling in the deserted homes of their mammalian companions or, occasionally, in those that they have excavated by their own efforts. At one time it was believed that the marmots and owls lived together in harmony and shared the same burrows, and it has even been stated that rattlesnakes, frogs, and tortoises were included in the happy family. At the present day, however, we know that such is not the case, and that it is only the uninhabited burrows which the owls appropriate to their use; while as regards the rattlesnakes, although it is true that they do at times force their presence within a marmot's sanctum, yet it is not

A JOY RIDE—MONKEY AND WOMBAT. [*Page 76.*]

A STRANGE FOSTER-MOTHER—A CAT AND SQUIRREL. [*Page 77.*]

STRANGE MESSMATES—A YOUNG HARE AND YOUNG BLACKBIRDS. [*Page* 77.]

A TRIPLE ALLIANCE—HERMIT CRAB, ANEMOŃE AND NEREIS. [*Page* 83.]

for the purpose of leaving their cards in a friendly fashion, but rather to satisfy the cravings of their appetites.

There are several species of birds which associate with quadrupeds for the purpose of feeding upon the ticks, etc., that are to be found upon their bodies, and in this country it is by no means uncommon to see starlings thus employed when perching upon the backs of sheep. With the Egyptian black-backed courser or crocodile-bird, belonging to the plover family, we have a species which, even in the days of Herodotus, was looked upon as the crocodile's friend on account of it always being found in the company of that reptile, and because it has the curious habit of feeding upon the leeches and remnants of food obtained from the open mouth of the creature as it lies basking in the sunshine upon the banks of the river Nile. When searching for these tit-bits, the 'feathered toothpicks'—which may be compared in size to a thrush, are decorated with lavender, buff, black and white plumage, and possess bright blue legs—even become so bold as to enter right inside the gaping jaws of their provender providers.

In Florida is found a species of frog, known as the gopher frog (*Rana capito*), which passes its existence, except for a brief period during the breeding season, within the burrows of the gopher tortoises (*Testudo polyphemus*); while, moreover, the abandoned homes of the latter creatures are frequently utilised as a dwelling-place by racoons, opossums, and owls. Then, again, the platypus

or duckbill shares its underground quarters with the Australian beaver-rat (*Hydromys chrysogaster*); and the New Zealand tuatera lizard frequently shelters various species of the petrel family within its subterranean domicile, the feathered folk generally taking up their residence at the right-hand side of the dwelling, and the reptile on the left.

Even amongst fish we find that certain kinds associate with other forms of aquatic creatures and dwell together under the most extraordinary circumstances. The small eel-like *Fierasfer* and *Encheliophis*, found in the Atlantic, Indo-Pacific, and Mediterranean Oceans, for instance, live in the gullets of sea-cucumbers and star-fish, or within the bodies of jelly-fish. They will also, at times, ensconce themselves within the shells of pearl-mussels, but not infrequently they suffer for their temerity in having selected such a situation and lose their lives by being encased in the pearly substance which the bivalves are able to deposit upon any matter which irritates their internal anatomy.

Some fish will associate with anemones, and take a toll of the food secured by their companions, but as the hosts do not make any use of their stinging powers in order to rid themselves of their messmates, it must be assumed that they are quite content to dwell in harmony with their self-invited guests, and allow them to dine from their table. Other fish are in the habit of dwelling within the shelter of the stinging-arms of jelly-fish, of which one species affords its protection to the fry of horse-

mackerel, and another to the young of whiting. It is not always, however, that the association between fish and jelly-fish is of an amicable nature, for certain kinds of the former, although resorting to the practice of sheltering beneath the umbrella-like form of the latter, actually feed upon the tentacles of their hosts, a deed which they can accomplish with impunity, as they are immune from any evil effects arising from the stinging powers of their victims. Small crustaceans will also attach themselves to jelly-fish; and we are told that a species of eel takes up its abode in the branchial sac of the angler-fish, and that the Brazilian cat-fish shelters certain other small fish within its mouth.

An anemone, known as *Polytha fatua*, is remarkable for the fact that it is always found attached to the Japanese glass-sponge (*Hyalonema*), in which situation it patiently waits for its food to drift towards it; while another one, called *Sagartia parasitica*, is rarely to be met with unless it be fixed to the shell of a hermit-crab. It has also been recorded that two different kinds of crabs, both of which are found in Mauritius, are in the habit of carrying about an anemone on each of their large pincer-like claws.

The hermit-crab, although of a very quarrelsome disposition towards its own kindred, is, nevertheless, quite sociably inclined towards many other creatures, for beyond affording a lodging upon the outside of its shell to an anemone, it will even extend its good nature so far as to house within its shell a worm-

like animal known as the nereis, which receives its name (bestowed upon it by Linnæus) from the mythological beings called Nereides, whom the Greeks believed to be the constant companions of Neptune. Notwithstanding that the nereis is guilty of taking a heavy toll of the hermit's food, yet the partnership between the two creatures is by no means a one-sided affair, for in return for its board and lodging it is stated to serve the part of a house-maid and keep the home clean.

Acorn barnacles are other objects that are often found attached to the shells of hermit-crabs, as well as to those of limpets and other shell-fish. Although at first sight they appear to be merely small conical excrescences, yet, in reality, they are the dwelling-places of living creatures, and if a close observation be made of them it will be noted that, from time to time, a number of tendril-like feelers are thrust through the summit of the shells, thereby revealing the presence of the animals within. It is not always, however, that hermit-crabs indulge in the luxury of a shell wherein to conceal themselves, and one species, known as the hairy-handed hermit, is invariably found with a sea-anemone adhering in close contact with its unprotected body; whilst another kind seeks protection for the hinder and softer parts of its anatomy by attaching itself to a sponge.

A very extraordinary instance of strange fellowship has been recorded by Fritz Müller, who, during his travels in Brazil, discovered a large caterpillar, clothed in long stinging hairs, which was feeding

upon the leaves of a mulberry tree, and upon whose back reposed a smaller and different species of caterpillar. That the peculiar situation selected by the latter was the result of deliberate choice on its part is proved by the fact that, on being removed from the person of its larger relative, the creature immediately made its way back again, clambered upon the body of its chosen companion and ensconced itself amidst the shelter of its protector's hairy armament.

CHAPTER VI

WILD ANIMALS WHICH ARE TRAINED BY MAN TO HUNT

THE custom of training wild animals to hunt other creatures can be traced back to a very early date, and although many of the practices which found favour in the past are no longer indulged in to the same extent as they used to be, yet in some parts of the world both beasts and birds are still utilised for coursing game.

Amongst the wild mammals which are trained for the chase of other animals, by far the largest and most imposing is the hunting-leopard, or cheetah, as it is often called, the latter term, however, being one which is liable to give rise to some confusion inasmuch as the name is derived from the Indian word 'chita,' meaning 'spotted,' and is applied also in that country to the ordinary leopard. Although the hunting-leopard is classified in zoological nomenclature amongst the cat tribe, yet it differs from the true felines in several particulars, the most important of which is that the animal has only the power to retract its claws to a

slight extent, and, consequently, the points always remain exposed to view, whereas those of all other cats can be entirely withdrawn and concealed within their protecting sheaths.

In general build the beast may be likened unto a greyhound on account of the great slenderness of its legs and body. When adult it attains to a length of seven feet, inclusive of its tail, which measures about thirty inches, and it stands about thirty to thirty-three inches in height at the shoulder. Its tawny-coloured coat is decorated with numerous and rather small black spots. The species is found in both Africa and India, but it is only in the latter country that the animals are employed for coursing game. No other creature can vie with the hunting-leopard for fleetness of foot, although it must be stated that its powers of endurance are not very great, and if it fails to overtake its quarry after a run of a few minutes it invariably gives up the chase. But should the beast be successful in its quest, it quickly brings its victim to the ground by tripping it up with a blow from its paw, and then dispatches it by gripping it across the throat. The writer is well able to vouch for the fact that the legs of a cheetah are, in spite of their slenderness, extremely muscular, for on one occasion, when he had entered the cage of an individual at the Zoo for the purpose of taking its photograph, it suddenly pounced upon the disturber of its peace, and grasped his legs with its fore-limbs, with the result that he was held a prisoner until the animal's keeper came to the rescue and forcibly dragged it off.

Although one would naturally expect to find that young animals would be more tractable and easier to train than adults, yet, curiously enough, the natives of India only catch fully-grown hunting-leopards for sporting purposes, and state that they prove far more satisfactory and reliable than if they had been procured as cubs. It is difficult to assign any definite reason for this preference, but it has been suggested that the babies learn the initial stages of the art of hunting much better from their parents than from human instructors. The method employed in the capture of the animals is for the natives to set snares, in the form of nooses made from the hide or sinews of antelopes, around the trees which the creatures are in the habit of sharpening their claws upon. When one of the beasts is thereby secured it is taken off to a neighbouring village and then undergoes a taming process which, although of a very drastic and cruel nature, is nevertheless very efficient, for the unfortunate captive is starved and also prevented from obtaining any sleep until it becomes so exhausted as to take little interest in life. As soon as it has arrived at this state of dejection, its owner then brings it food and drink, and caresses and fondles it in an endeavour to win its confidence and affection, with the result that the creature soon shows its appreciation of the changed state of affairs, and quickly establishes a lasting friendship with its late enemy. Its education as a hunter of game then commences, but such work is merely a matter of controlling and directing its natural instincts to slay, and,

beyond demanding a certain amount of time and patience, is not a difficult task to pursue.

On being taken out to hunt, the leopard, with a bandage or ' hood ' placed over its eyes, is enclosed within a cage on wheels, to which a pair of bullocks are harnessed. It is then conveyed to the district where its quarry, usually the black-buck or Indian antelope, is to be found, and, having arrived there, the animal is removed from its travelling cage by its keeper and placed upon the outside of the structure in readiness to be released for the chase. Directly the game is sighted, the bandage is removed from the creature's eyes and its leash undone. Taking a look around and espying its prey, the leopard will stealthily creep along towards its victim and, having succeeded in approaching near enough to its liking, rush forward to its quarry, which it rarely fails to overtake and overthrow. In the meanwhile its keeper and the assembly of spectators have been following the chase as rapidly as possible, and the former, on coming up to the leopard, quickly replaces the hood over its eyes, fills a bowl with the blood of its prey and, after removing the hood once again, offers it a drink and thereby induces it to release its hold upon its victim, when it is then taken back to its cage. It is recorded that the Persians employed the cheetah for the purpose of hunting game as far back as the year 865 B.C., and that the Assyrians also indulged in the practice at an even earlier date.

The caracal, or red-lynx, as it is sometimes called, is another of the cat tribe which is kept by the

natives in certain parts of India for the purpose of hunting other animals, and in common with the hunting-leopard it holds the distinction of being one of the few species of mammals which are found both in Africa and India. When fully grown it attains to a total measurement of about three feet, of which the tail accounts for some nine or ten inches. Although somewhat variable in colour, as a rule, however, its fur is of an almost uniform reddish-brown tint, whilst its ears are furnished with long tufts of black hair. It is extremely active and feeds upon gazelles and deer, as well as upon various species of birds. When pursuing the latter the creature will sometimes spring upwards for a distance of as much as two yards from the ground, and then strike down its prey in mid-air. In a wild state caracals are of a very savage disposition, but the natives of India appear to have little trouble in taming and training them. A favourite pastime is to let a pair of the animals loose amidst a flock of domestic pigeons which are feeding upon the ground in order to see how many of the birds they can manage to knock down before their unsuspecting prey can fly away to safety.

Some idea of the agility of the felines may be gathered by mentioning that they may succeed in bringing down as many as a score of the feathered folk during the lapse of a few seconds.

It appears that the Egyptian cat was also tamed and used for the capture of waterfowl, for an old picture in the British Museum shows one of the creatures being thus employed with a captive

bird in its mouth, a second one within the grasp of its fore-paws, and another one beneath its hind paws. Mr. Grosse writes of the species :—' The cat, strange as it appears, was certainly taught to seize upon the birds. . . . It is probable also that the repugnance of this animal to wet her feet having been overcome by training, she was accustomed to fetch such birds as fell into the water.'

Quite a large and varied number of wild creatures are utilised by mankind for the work of catching rats, but some of these have been associated with human beings and bred in captivity for so many generations that they may now be regarded as domestic animals. The well-known ferret, for instance, is but a variety of the wild polecat which has become somewhat modified in form as a result of its having been kept and reared in a captive state for so long. We read that it was employed in the days of Pliny for rabbit-hunting, while its presence in England can be traced back for six hundred years or more. It is somewhat smaller than its wild relative, and usually possesses a yellowish-white coat and pink eyes, but a variety known as the polecat-ferret has tawny-coloured fur. When used for hunting rabbits, it is the custom to place a muzzle over the creature's mouth, for otherwise it might remain in the burrows of its prey and slaughter the inmates and feast upon their bodies instead of causing them to bolt ; but when it is employed as a ratter it works unmuzzled on account of the formidable character and bold disposition of these rodents. We are told also

that the ferret is utilised by some people for the purpose of killing fowls which are destined to be served at table. During the great European War a number of ferrets were sent out to the troops in Flanders in order to help the men to catch the rats which swarmed in the trenches and dug-outs. One dealer alone sent out from Ashford, in Kent, no less than 500 ferrets, for which he obtained 5*s*. each, although they usually only fetch 1*s*. each in normal times.

The mink is another animal which is used as a rat catcher in the same manner as a ferret, and in its native country of America the species has been bred and kept in a semi-domestic state for that purpose. Certain kinds of weasels are also employed to dislodge the pretty little chinchillas from out of their burrows, while the South African zorilla, or Cape polecat, as it is sometimes called, is frequently tamed and kept in the houses of the Dutch Boers for catching rats and mice, as also is the common genet in Southern Europe.

The Indian mongoose is well known as a catcher of rats, and some idea of the benefit it has rendered to mankind may be judged by stating that some years back the sugar-canes in Jamaica were damaged by a certain species of rat which swarmed over the plantations in such numbers as to make it almost impossible for the inhabitants to continue to grow the crop. Although many remedies were tried to stop the depredations of the rodents, none of them proved successful until, as a last experiment, nine mongooses were imported and let free upon

the island. These proved the salvation of the sugar-planters, for in a few years the alien carnivora increased in numbers to such an extent as to cause the plague of rats to be suppressed, thereby saving the people a sum of about £150,000 a year. Mongooses have since been introduced to Barbadoes, Cuba, Costa, Rica, Santa Cruz, and Porto Rico in order to continue the good work which they so successfully accomplished in Jamaica.

Foxes are the very latest addition to the ranks of animals employed in the capture of rats, for we read in a recent issue of the *Daily Mail* :—

In the quaint Derbyshire hamlet of Ambergate lives John Gaunt, a famous rat-catcher. He is nearly sixty-seven years of age, and is often to be seen over hill and in dale with his two tame foxes tucked under his arms. He claims to be the only man in this country who has trained foxes to work with ferrets.

Whenever rats are numerous in any of the buildings belonging to the Midland Railway it is customary for a letter and a railway pass to be sent to old John. He has been killing railway rats for twenty-five years. When a boy he was taught rat-catching by his father. He soon found the work lucrative and adopted it as his calling.

'When a lad I kept killing a few rats in my spare time,' he said, '. . . and I gave such satisfaction that I got recommended from one farm to another till I got known all over the country.

'Some twenty years ago I found a nest of foxes in a wood and took one home. I trained him to kill rats and broke him in to a ferret, and took him up and down the country with me. Since then I've broken in about six young foxes—and fine they are to work with. They can follow a rat where a dog cannot, for, as you may know, a fox is used to getting his living in the dark.'

In some Eastern countries tamed otters are employed by the fishermen for driving the fish into their nets, and Bishop Heber, when journeying on a river in Bengal, records having seen on one occasion nine or ten of the creatures which were '. . . tethered with straw collars and strings to bamboo stakes on the banks. Some were swimming about at the full extent of their strings, or lying half in and half out of the water; others were rolling themselves in the sun on the sandy bank, uttering a shrill whistling noise, as if in play. I am told that most of the fishermen in the neighbourhood kept one or more of these animals, who were as tame as dogs and of great service in fishing. . . .'

The ancient Egyptians used to tame and train various wild animals, such as lions, leopards, cheetahs, and striped hyænas, for the purpose of hunting other creatures. It is recorded that the lions were sometimes clipped by their owners, and we may well imagine the extraordinary appearance of the king of beasts as he paraded about in the guise of a glorified poodle dog.

So far we have confined our remarks to mammalian hunters, but if we give our attention to the avian fauna we find that numerous species have been impressed into the service of man for sporting purposes. Quite a large number of the hawks and falcons are trained for the pursuit of game, the quarry including grouse, black-game, partridges, pheasants, ducks, woodcock, snipe, herons, quails, land-rails, rooks, crows, ravens, blackbirds,

jays, magpies, gulls, storks, ibises, spoonbills, pea-fowl, jungle-fowl, bustards, kites, and even gazelles ; while in China some of them are trained to capture butterflies, and in Arabia they are used for the purpose of hunting wild goats.

Although the practice of falconry has practically ceased to exist in this country, yet in days gone by it was a favourite pastime with all classes of the populace, and according to one's station in life so was the individual assigned a certain kind of hawk for his or her use. The gerfalcon, for instance, was reserved for the sole use of a king ; the falcon gentle or tercel gentle, for a prince ; the falcon of the rock, for a duke ; and the peregrine falcon, for an earl. The use of the bastard falcon was assigned to the baron ; the sacer falcon, to the knight ; and the harrier, to the squire. For the lady was reserved the use of the merlin ; for the young man, the hobby ; while the goshawk was employed by the yeoman. The poor man flew the tercel ; the servant or knave, the kestrel ; while the priest was allowed to hunt with the sparrow-hawk, and the higher grades of the clergy were assigned various birds, according to their rank. Should anybody carry a hawk of a different kind to that allotted to his status in life, he was fined for so doing.

That falconry was a very ancient form of pastime is proved by the many records of the same which have been handed down to us. We read that it was practised in China as far back as 2,000 years B.C., and that the Japanese indulged in the sport

at least 600 years B.C. Pliny, Aristotle, and Martial all mention the sport as being practised in Europe during their time (between 384 B.C. and A.D. 40), while its introduction into England from the Continent is believed to have taken place during the reign of the Saxon monarch King Ethelbert, about the year 860. King Alfred the Great wrote a treatise upon falconry and the management of hawks, and Edward the Confessor is said to have spent most of his leisure in hunting and hawking. Henry VIII was also very fond of hawking, and we read that 'on one occasion it bade fair to be his death; for, being in pursuit of his game afoot, at Hitchin, in Hertfordshire, and attempting to leap a ditch by the aid of a pole, the treacherous stick snapped as Henry was at the height of his vault, and down he plumped, so that his head was buried in the mud. A friendly footman happened to be at hand, or there would have been an end to the King's hawking.'

Many laws were passed at various times to regulate the sport, and King William I proclaimed that only those people of high rank were to be allowed to indulge in the practice. This restriction, however, was repealed during the reign of King John. Henry VII made it an offence for any one to take the eggs from the nest of a falcon or hawk, and should an offender be caught in the act he was imprisoned for a year and a day, and had to pay a heavy fine.

During the reign of Henry VIII, wild hawks and kites were frequently to be seen in London, and on account of the good service they rendered

A PAIR OF CHEETAHS OR HUNTING-LEOPARDS. [*Pages* 86 & 89.]

AN INDIAN MONGOOSE—A FAMOUS RAT-CATCHER. [*Page* 92.]

THE GOSHAWK—THE LARGEST OF THE HAWK FAMILY. [*Page* 101.]

A PEREGRINE FALCON WEARING ITS HOOD. [*Page* 97.]

to the populace by removing refuse from the streets, they were allowed to go their way unmolested, Bishop Stanley wrote :—' On and about the dome of St. Paul's they may be often seen, and within a very few years a pair for several seasons built their nest and reared their brood, in perfect safety, between the golden dragon's wings which formed the weathercock of Bow Church, in Cheapside.'

Curiously enough, at the time of writing a peregrine falcon has been paying a visit to St. Paul's Cathedral in order to feed upon the tame pigeons that have for so long taken up their abode in the neighbourhood.

The marauder is one of a pair of birds that have taken up their abode in Bromley, Kent, where they have already made their presence felt by killing several partridges and pheasants. The *Daily Mail*, in an interesting account of these birds, states :—' Yesterday an omnibus proceeding along the main road to Farnborough stopped, the curiosity of the driver having been aroused by a group of people watching the aerial manœuvres of many hundreds of rooks, the inhabitants of a large and extended colony bordering the roadway. In a clangouring rush they had left the elms and swept high into the air, forming a vast circle. The cries uttered by the birds were sharper and more querulous than usual. Suddenly all sound ceased, but the agitated circular flight continued, ever mounting higher. Then one segment of the ring appeared to break, and the whole flight converged in a black water-spout-like formation. diving rapidly to earth.

The cries of the rooks were heard for several miles.

'Two of the birds came down as though shot, and on being retrieved were found to have broken and ripped backs. For some minutes the fight continued—the whole colony mobbing the pair of peregrines, who secured three more victims, all falling and mutilated in like manner.

'Eventually the falcons swept away, easily outdistancing the clumsier rooks. When last seen they were observed to be flying in a south-easterly direction. Peregrine falcons have not been known to appear so near to London for nearly a century.'

It was quite a common practice in olden days for the people to carry their trained hawks when they promenaded the streets, and they would also take their feathered companions to church. During the reign of Edward III, it is recorded that the Bishop of Ely attended service at a certain church in Southwark, and left his hawk in the cloister whilst he proceeded with his devotions; but, when he returned to fetch the bird, he found it had been stolen, whereupon his wrath was so great that he promptly pronounced excommunication upon the thief.

In a like manner to the present-day custom of wearing various garments which are considered to be appropriate to certain sports, so in the past did the falconer deck himself out in a special costume when he went out to the chase. His jacket or jerkin was slashed and adorned with lace; his breeches were stuffed out balloon-like from

the hips downwards, and edged with lace at the knee; his hat was decorated with plumes; and his gloves or gauntlets were embroidered with needlework, and further embellished with spangles.

The birds which were employed in England for hawking were the Greenland falcon, the Iceland falcon, the Norway falcon, the peregrine falcon, the goshawk, the sparrow-hawk, the merlin, the hobby, and, occasionally, the lanner falcon and the sacer falcon. For the purpose of training, they were sometimes taken from the nest and at other times they were wild caught; a nestling being called an 'eyess' or 'eyas,' and a wild bird being known as a 'passage hawk.' The former were allowed a certain amount of liberty in order that they might become proficient in flying and gain strength, and were taught to return to their owners for the food which was given to them every evening. When, however, they began to be irregular in their habits and did not put in an appearance at meal times, it was a sure sign that they had learned to hunt on their own account, and that the hour had arrived for their education to be taken in hand. But before we describe the manner in which the birds were tamed and trained, it will be as well to give a brief description of the various objects, such as the hood, the brail, the jesses, the bells, and the lure, which were employed in their tuition. There are two kinds of the first-named article, the one known as the 'rufter,' which is made of soft cloth or shammy leather, being used when training untamed birds; and the second, called the 'hood

proper,' which is manufactured with strong leather, and usually adorned with a tuft of feathers at its summit, being worn by trained hawks. Each has an opening in front in order to allow for the protrusion of the bird's beak, and is secured over its head by pulling together some interlacing thongs. The brail is a soft strip of leather employed for the purpose of preventing the hawk from making use of its wings ; and the jesses are strings of the same material, measuring about eight inches in length, to which a swivel is attached. The latter are secured to the bird's legs, and, when once in place, are never removed. The leash is a long leathern thong that can be fixed on to one of the swivels or released as required ; while the bells are secured to the bird's legs, and serve to denote its whereabouts.

The first thing to do when training a hawk is to tame it, and accustom it to be in the presence of human beings and to be handled by them. The preliminary stages of this work are always undertaken in a dark room, and the bird is hooded in order to keep it quiet. The owner carries the feathered pupil upon his hand for hours on end, and constantly strokes its back and legs with a feather, with the result that it gradually learns to sit still and to submit to being touched. At feeding time an offering of meat is laid across the bird's feet, and it feeds with its hood on ; but as its education proceeds, it is fed with its hood off ; first by the light of a candle and afterwards in full daylight. The hawk is then ready to be taught to come to

a 'lure,' which may be either a dead bird such as a pigeon, or an artificial arrangement made of wood, leather, feathers, a swivel and cord, and some pieces of meat. This is first of all placed upon the ground quite close to the bird, then gradually removed further and further off until, ultimately, the hawk is trained to fly to it from a considerable distance away. When the bird has become proficient at flying to the lure, it is then flown at a live domestic pigeon, and, finally, at wild game.

One of the largest of the hawk family is the European goshawk, or goose-hawk, as it is also called. Unlike the falcons, which rise high into the air when chasing their prey and then suddenly pounce or 'stoop' upon their victims from above, the goshawk flies directly after its quarry in a manner which is known as 'raking.' Of the several varieties of this bird which are to be met with in foreign countries, one called the 'shabeen' by the natives of Syria, which only attains to the size of a domestic pigeon, was formerly trained and employed to fly at eagles. The hawk was taught to grasp the eagle by the wing with its claws, and thus deprive the quarry of the power to fly, with the result that the hunter and the hunted would come tumbling down to the ground. The owner of the hawk would then rush up and endeavour to secure the king of birds before it was able to free itself from the grasp of its diminutive antagonist. The shabeen was used also for flying at herons and storks.

Under the name of gerfalcons are included the

Greenland falcon or white gerfalcon, the Iceland falcon, and the Norway falcon or true gerfalcon. In olden days they were in great demand for sporting purposes, and trained individuals were worth a considerable sum of money. Water-fowl and ptarmigan were their chief quarry, but it is reported that the Iceland falcon was employed also for hunting the great bustard. A closely-allied form to the foregoing is the sacer falcon, found in S.E. Europe, N.E. Africa, Central Asia, and North China, which is used by the natives of India to fly at hares, cranes, bustards, and kites, while in Palestine it is trained to hunt gazelles.

The peregrine falcon is an interesting species inasmuch as it nests in this country. It is also found in many other parts of the world, for, as its Latin name '*peregrinus*' implies, it is a 'wanderer.' The female, termed in the language of falconry 'the falcon,' grows to a length of about seventeen inches, while the male, called the 'tiercel' or 'tarsel,' is somewhat smaller. The flight of the peregrine is extremely rapid, the bird having been known to cover a distance of one hundred and fifty miles during the course of an hour.

The hobby is also found in the British Isles, but its range further extends over Europe, North Asia, India, North China, and South Africa; the latter region being visited by the bird during our winter months. Although formerly trained and used in hawking, yet as a rule the bird was not employed to actually catch the larks, partridges, etc., which formed its quarry, but rather for the

purpose of frightening them, and thereby enabling the falconer to capture the terrified creatures in nets, the practice being known as 'daring.'

The smallest of all falcons to be met with in Great Britain is the merlin, an adult hen only measuring twelve inches in length, and the cock about ten inches. In spite of its diminutive proportions, however, the bird was utilised for flying at pigeons; indeed, it was considered to be better suited for that purpose than the peregrine falcon because it would not hesitate to follow its quarry amidst the branches of a tree or the tangle of a hedge.

The common sparrow-hawk is another well-known bird in this country which was formerly kept for the purpose of flying at partridges, thrushes, blackbirds, etc.; but even more familiar is the kestrel, or windhover, as it is also called, on account of its habit of remaining in one spot in mid-air whilst it rapidly moves its wings.

In addition to the foregoing, the golden eagle was tamed and trained for sporting purposes in days gone by, and the Kirghiz tribe of the Asiatic steppes employed it to hunt various kinds of mammals, amongst which were to be numbered wolves and foxes. It was the custom to keep the bird hooded except when it was required for the chase, or when it was being fed. When taken out to hunt, the eagle sat upon the gauntleted wrist of its owner, who, mounted on horseback, grasped a T-shaped crutch made of wood and horn, and fixed to the front of his saddle in order that he

might more easily support the weight of his feathered companion.

In China and Japan it has for long been the custom for the people to train cormorants to capture fish and bring them to their masters. As a general rule the birds wear a rubber ring or collar around their necks, to which a cord is attached ; the former being employed in order to prevent the feathered hunters from swallowing their prey, and the latter being used for the purpose of hauling them back to the boat or bank from which the operations are conducted. The most highly-trained birds, however, are allowed full freedom of movement and do not wear any collar.

CHAPTER VII

ANIMAL SANCTUARIES

THAT mankind has at last realised his responsibilities towards the wild animals which populate the earth is made manifest by the efforts he has made of late years to afford them a certain amount of protection against the commercial and sporting instincts of a section of the community, and although, unfortunately, some creatures have been hunted and slaughtered to such an extent as to leave little hope of their ever again being plentiful in their haunts, yet, happily, it is not too late to save others from a similar fate. There can be no doubt that, in the majority of countries at all events, animals receive greater consideration and more humane treatment at the present day than they did in the past, and the various societies which work on behalf of the dumb creatures have rendered a great service in the cause of humanity. But apart from all sentimental reasons, it is the duty of the present generation of mankind to assure that the living races of animals be preserved for the enjoyment and use of posterity; while, moreover, it has been forcibly brought to our notice

that the undue persecution of a given species may upset the balance of Nature, with results that are likely to prove very serious to us.

Few living creatures are more valuable to man than the insectivorous birds, for they feed upon such destructive pests as bark-beetles, wood-boring beetles, grasshoppers, wire-worms, plant-lice or aphides, weevils, caterpillars, slugs, etc., which, if left to multiply unchecked, would soon cause such injury to trees, foliage, roots and fruits as to obliterate all traces of vegetation from the face of the earth and convert it into a barren waste; for even in their present numbers their ravages are very pronounced, and a well-known naturalist writes :—'I believe it is no exaggeration to estimate that more trees are annually destroyed in the United States by insects than are destroyed by fire; and yet more is said about the protection of forests from fire than from insects.' Although the indiscriminate killing of wild creatures may prove very detrimental to man, yet, on the other hand, we have ample evidence that it is not always advisable to introduce them artificially into regions where they have previously been unknown. The havoc wrought in Australia and New Zealand by imported live rabbits has proved a serious nuisance to the agriculturist owing to the astonishing fecundity of the species, and in spite of the fact that many millions are killed every year for the purpose of obtaining their skins, there appears to be little likelihood of their numbers being kept within bounds. Some idea of the difficulties

attending the suppression of these rodents may be gathered by stating that they have even learned to climb over the wire netting which, in some districts, has been placed across their path in an endeavour to stop them from spreading further afield; while, moreover, the experiment which was tried of introducing weasels, stoats, and mongooses amidst their haunts, in the hope that they would prey upon the rabbits, has only made matters worse, for the alien carnivora have since shown a decided preference for dining upon such fare as domestic ducks, fowls, geese, etc. We are also told that, in New Zealand, the rabbits have become so abundant in certain parts that the colonists are faced with the probability of having to vacate their homesteads owing to their inability to suppress the increase of the rodents.

It will therefore be seen that in our endeavours to conserve animal life we must be careful not to encourage the multiplication of one species to the detriment of others, or to introduce wild creatures into new pastures where they can multiply unchecked; but apart from such considerations, any protection that we may be able to afford them is only their just due and a slight atonement for the merciless treatment which human beings have meted out to them in the past.

There are several ways by which civilised man now gives his protection to animals, and many laws have been passed to establish a 'close time' during which certain kinds may not be molested or shot, and, in the case of birds, making it an

offence to take their eggs during the nesting season. Then, again, a very happy idea was that which resulted in the placing of perches outside some of the lighthouses situated in those regions where birds are in the habit of passing during their migratory passages, thereby enabling them to rest and recover from the fatigue attending a long flight across the ocean. Formerly, it was quite a common occurrence for hundreds of the feathered migrants to die from the result of beating themselves against the glass which shields the attracting lights but offers no foothold whereon they can come to rest. Although the latter measure has been productive of very good results, and has proved the salvation of many birds, yet, after all, it is only of a temporary benefit to them, for when once they have passed beyond the sphere of its influence they still have to reckon with other dangers, some of which are unavoidable and in accordance with the laws of Nature, while others are due to those human beings who, with gun, trap, snare, or other implement, take a heavy toll of their lives. In order to provide a further means of protection, many Governments and Societies have established animal sanctuaries in various parts of the world wherein all kinds of wild life may find a haven of refuge and live free from molestation.

The British Isles has for long ceased to be the home of any large mammals (with the exception of certain species of deer), and it may well be said that even were any to remain there would be little room for them to dwell in quietude and beyond

the reach of the network of railways and roads which radiate in all directions, while in regard to the majority of the smaller kinds which are indigenous to this country, they are better able to take care of themselves.

In the case of our birds, however, although the question of lack of space does not arise, inasmuch as they are able to journey from one place to another in an element which the human race has but lately made use of for the purpose of flights in aeroplanes or airships, yet, nevertheless, the craze for securing specimens of the rarer types, and the collecting of their eggs, has proved very detrimental to their welfare and greatly reduced their numbers. Then, also, the growth of our cities and towns has been the cause of driving our feathered folk further afield ; but efforts have been made in many districts to stop their exodus by providing them with sanctuaries wherein they can build their nests and rear their young undisturbed. One of the best-known bird sanctuaries in the vicinity of London is situated in the Brent Valley and supported by the members of the Selborne Society ; while in the metropolis itself there is an enclosure devoted to the preservation of bird life in Highgate Woods. Others have been established at Letchworth, in Hertfordshire, and at Brean Down, in Somerset ; the latter owing its inception to the Royal Society for the Protection of Birds.

It is, however, the large game reserves or sanctuaries of foreign climes that appeal to the imagination far more than the humble establish-

ments in our own country, and of these, that known as Yellowstone Park, situated in the State of Wyoming, U.S.A., amidst the Rocky Mountains, and wherein bears, moose, bison, deer, mountain-sheep or big-horn, antelopes, pumas, beavers, porcupines, squirrels, foxes of various kinds, prairie wolves or coyotes, wolverines or gluttons, skunks, badgers, and many other animals find a home, covers an area of over two million acres of territory ; while to ride around its boundaries would necessitate a journey of about two hundred miles. In this haven of refuge the life of all wild animals, provided they do not prove a danger to the community, is preserved with the utmost rigour of the law, and no shooting or trapping is allowed within its precincts, with the consequent result that the creatures become exceedingly tame. During the winter months the antelopes and deer are provided with a supply of hay upon which to feed, and it is surprising to note how these normally timid beasts have lost their fear of man and, as a matter of course, accept the provender from the keepers who administer to their needs. The black bears and grizzly bears have become even more bold and confiding than the foregoing, and do not hesitate to approach quite close to the various hotels which are situated in the Park in order to search amongst the garbage heaps for such items as discarded jam-jars, meat-tins, etc., and to feed upon any remains that may happen to be left within. Indeed, they will sometimes go so far as to enter the portals of the hotels in their quest for food, and it is recorded

that one of the maid-servants at the Mammoth Hot Springs Hotel made a practice of feeding them with lumps of sugar, and that some of the animals would take the proffered dainties out of her hands. On several occasions the bears have been known to commandeer a supply of comestibles from the tents of camping parties, but as a rule they are quite good natured, and if chased by the tourist merely give an exhibition of their tree-climbing powers in order to evade further pursuit. Of late years, however, some of them have shown signs of becoming somewhat aggressive towards visitors—in all probability as the result of their having discovered that mankind without a gun in his possession is a puny creature in comparison to his bearship—so that, from time to time, a few of them are caught and sent off to populate various zoological gardens.

The preservation of animal life in sanctuaries, and the resulting fearlessness of the creatures towards human beings, gives the naturalist an opportunity of studying their habits under exceptionally favourable conditions, and also enables the photographer to secure pictures of them with greater facility than would otherwise be possible. Few of us, however, would care to emulate the deeds of one camera enthusiast who, in the Yellowstone Park, concealed himself amidst a garbage heap, and then patiently waited for the bears to approach.

In spite of the constant watchfulness of the guardians of the Park, a certain amount of poaching

is perpetrated by individuals who have no regard for the welfare of living creatures so long as they can make money by slaughtering them, and the small herd of American bison which dwell therein have suffered at their hands to such an extent that, at the present day, there are only about a score of these magnificent animals left there. There are, however, four other reserves in the United States which are devoted entirely to the preservation of the American bison; one being situated in the State of Nebraska; another in Montana; a third in Oklahoma; and another in South Dakota; all of which owe their existence to the United States Government, and to the Bison Society, which was inaugurated in December, 1905. The first of the bison reserves to be established in America was the Wichita National Buffalo Range, which is situated in the State of Oklahoma, comprises an area of about twelve square miles, and is surrounded by a strong wire fence some six feet or so in height. The populating of this sanctuary was undertaken by the New York Zoological Society, who presented fifteen bison from amongst those at their Gardens, and, after each animal had been enclosed in a specially-built and carefully-padded crate, it was sent off upon its long railway journey of more than two thousand miles, which took a week to accomplish. The stocking of the range having been completed, the Bison Society then commenced to establish another sanctuary on the Flathead Indian Reservation, situated in the State of Montana, and covering

an area of twenty square miles. For this purpose the Government of the United States made a grant of £8,000, of which £6,000 was set aside for the purchase of the ground from the Indians, and the remaining £2,000 for the erection of the fences; while the Bison Society undertook to supply the animals.

Other notable animal sanctuaries in the United States of America are the Grand Canyon National Park, which covers an area of two million acres of ground; the Mount Olympus National Monument in Washington, consisting of half a million acres, and wherein a herd of about twelve hundred wapiti deer (or elk, as they are frequently called in that country) roam at large; the Superior Game and Forest Preserve, consisting of one million acres of territory; and also several smaller ones.

In Canada there are two well-known bison reserves known respectively as Elk Island Park, and Buffalo Park, both of which are situated in the State of Alberta. The former was established in the year 1906, and comprises an area of 10,240 acres; and the latter had its origin in the year 1908, and covers 101,760 acres of territory. The first bison to populate the Elk Island Park numbered 628 head, and were the descendants of a small stock of 36 individuals, brought together in the year 1884, and owned by Mr. Pablo. In regard to the Buffalo Park sanctuary, Mr. Shepstone, to whom the writer is indebted for much of the foregoing and subsequent information, states :—'About a hundred thousand acres of this reserve have been enclosed

by a fourteen-strand wire fence, seventy-three miles in length, with two cross fences, forming enclosures for the buffalo during the breeding season. . . . The area enclosed at present is considered sufficient for the support of from 5,000 to 7,000 buffaloes. There are now 700 of the creatures on this reservation, the largest herd in the world.'

Apart from the above-mentioned reserves, there are no less than nine others situated in North America. The largest of these is the Temagami Reserve, in the State of Ontario, which is 3,750,000 acres in extent; and the next in size is Jasper Park, in Alberta, which comprises an area of 3,200,000 acres. The Rocky Mountains Park, or Banff Park, as it is frequently called, also in the State of Alberta, is of 2,880,000 acres; the Alogonquin National Park, in Ontario, 1,800,000 acres; while the Lauertides National Park, of Quebec, covers an area of 1,689,600 acres. A somewhat smaller reserve known as Yoho Park, in Alberta, covers 530,000 acres; and the Glacier Park, also in the same State, is 368,640 acres in extent. In British Columbia, the East Kootenay Reserve covers an area of 288,000 acres; and another one, in the Yalokom Mountains, 192,000 acres. The authority previously quoted tells us that Banff Park was first established as an animal sanctuary by an Act of Parliament which was passed in the year 1887. It is a very popular resort for holiday-makers, for besides the live moose, various kinds of bears, deer, foxes, wolves, lynxes, marmots,

sheep, badgers, racoons, etc., which are to be seen within its precincts, there is also a very interesting museum. The Yoho Park was first devoted to the purpose of serving as a haven of refuge for animals in the year 1901, and the Glacier Park in the year 1888; while Jasper Park had its origin as a wild-life sanctuary in 1907; and the East Kootenay Reserve in the year 1908.

The preservation of the wild fauna of Australia has not been overlooked, and at Wilson's Promontory, in Victoria, an area of 160 square miles, comprising about 101,000 acres, has been set aside as an animal sanctuary. A fence has been erected across the neck of land in order to separate it from the mainland and to prevent such undesirable creatures as rabbits and foxes from establishing themselves within the reserve. This barrier serves also to keep the rightful inmates from straying beyond bounds. Amongst the mammals which populate this National Park are to be numbered some great grey-kangaroos, various species of wallabies, opossums or phalangers, bandicoots and wombats, while the most important of the avian denizens are some bower-birds, lyre-birds and emus. From the latest reports it appears that the creatures are thriving well and are quite contented with their quarters, although the emus, when first introduced to their new home, endeavoured to explore beyond the boundaries of the sanctuary by swimming across the Darby river which flows alongside.

In the colony of New Zealand special efforts are being made to preserve the native fauna, and several areas of territory, such as the Little Barrier Island and Gouland Downs, have been proclaimed as sanctuaries wherein the wild life may remain undisturbed. The latter reserve is situated in the Nelson province of New Zealand, and owes its inception to Mr. R. E. Clouston, a mining engineer, who, when exploring in that region, quite recently and unexpectedly discovered that a considerable number of rare birds, including Kea or Kaka parrots, owl or night-parrots, tuis, rifle-birds, rain-birds, and the great apteryx frequented the district. As the ground happened to belong to the Crown, it was quickly set apart as a sanctuary for the feathered folk.

Amidst the British possessions in Africa there are quite a number of reserves for the preservation of animal life. Of these, seven are situated in Rhodesia, four in Nigeria, three in the Transvaal, two in the Sudan, two in Somaliland, two in Uganda, and a like number in both Nyasaland and British East Africa. In addition there are several others in Cape Colony and Natal.

The establishment of many of these animal sanctuaries was due, to a great extent, to the efforts of the Society for the Preservation of the Wild Fauna of the Empire, which was inaugurated in the year 1903. That the creatures which dwell therein appreciate and recognise the protection afforded to them is proved by the fact that, in the Southern Game Reserve of British East Africa,

it is by no means an uncommon experience for travellers who may be journeying on the Uganda Railway to be able to observe various animals feeding and roaming about in the vicinity of the line, and quite indifferent to the passage of the train or the steaming and puffing of the engine.

Amongst the animals which dwell amidst the various sanctuaries in the African continent are to be numbered the hippopotamus, the rhinoceros, the eland, various species of zebras, the greater and lesser koodoo, the hartebeeste, the brindled and white-tailed gnus or wildebeestes, the elephant, the dainty little klipspringer antelope, the buffalo, the roan and the sable antelopes, the blessbok, and many others.

So far our remarks have been devoted principally to the preservation of mammals, but it must not be imagined that the avian population of the universe is not receiving a full share of attention from the hands of those who endeavour to protect wild life from extermination, for many laws have been passed on their behalf, and numerous areas of territory set apart for their use as feeding grounds and sanctuaries. Much credit is due to the Government of the United States for their work on behalf of bird life, and it is pleasing to note that Mr. Hornaday, in a lecture delivered at Yale University, stated :—'To-day the ports of the United States and its colonial possessions are absolutely closed to the plumage of wild birds,' with the result that, 'in Berlin, the price of aigrettes have fallen

twenty per cent., and in Paris the milliners fear that the fashion for aigrettes is as good as dead, because their best customers can wear them no more.'

There are rather more than fifty bird sanctuaries in the United States. These are situated along the coasts, consist of numerous small islands, and are the resort of herons, gulls, terns, egrets, pelicans, ducks, etc. That known as Pelican Island, off the coast of Florida, is, as its name implies, a avourite spot where pelicans congregate and nest. It was first proclaimed as a sanctuary in the year 1903, and although it only covers an area of about three acres of ground, yet, owing to the sociable nature of the birds which select the island for their home, there is sufficient accommodation for the two thousand or so individuals which dwell and nest thereon. Of the bird sanctuaries nearer home we read that in the year 1907 the State of Hamburg established one as a breeding place for sea-fowl upon the Island of Neuwerk, at the mouth of the Elbe; while at a somewhat earlier date the British Government set aside a portion of the Shetland Islands as a refuge for the great skua or bonxie.

The protection of animals by mankind may be said to have had its origin at a very early date, for the ancient Egyptians regarded many creatures such as baboons, snakes, shrews, wolves, crocodiles, certain fish and beetles, and even lions and hippopotami, as sacred. It was considered a great crime for any person to kill or injure one of these, the

offender being liable to be sentenced to death. Although the inhabitants of some countries still retain a certain degree of religious veneration towards living creatures, yet, as a general rule, the denizens of the wild are looked upon as mere chattels of mankind which he considers he is justified in treating as he thinks fit, and, consequently, they have been persecuted to such an extent that, in many instances, they have been almost, and even entirely, wiped off the face of the earth. The fate of the American bison, for instance, is an object lesson for all, and shows to what an extent human beings will go should their inclinations remain unchecked, for whereas during the life of the present generation those noble creatures were to be found by the million—indeed, were so plentiful that the Cree Indians were under the impression that they came out of a great cavern in the earth in a never-ending stream—yet to-day they have almost been exterminated by the greed of hunters, although, happily, those few individuals which still dwell upon earth now receive the protection of laws passed on their behalf. 'The killing of an American bison for a tongue to sell for fifty cents; the killing of a fine bull elk for a pair of misshapen and ugly teeth worth a dollar; the killing of a walrus for fun from the deck of a swiftly-moving steamer; the killing of a brown pelican merely to see it fall,—all are crimes, and should be classed in the annals of crime as murder. The murder of a wild-animal species consists in taking from it that which man, with all his cunning, can never

give back,—its God-given place in the ranks of living things' : thus wrote Mr. Hornaday in words which burn deeply into the minds of all people who have a spark of humanity in them.

CHAPTER VIII

MAMMALS AS NEST BUILDERS

WE are all of us familiar with the fact that most birds build nests, but it is not so generally known that quite a number of mammals indulge also in a similar practice. It is true that the majority of the latter do not erect such elaborate structures as those of the feathered folk, but some of them prove exceptions to the general rule and build most wonderful homes.

One does not usually associate monkeys with nest building, yet certain species make a practice of constructing arboreal domiciles, some of which are very rude affairs, although, on the other hand, others are beautifully made. With the exception of the gibbons, all the anthropoid or man-like apes build nests or sleeping platforms. The chimpanzee makes its nest high up amidst the branches of the trees, beneath the shelter of which the male takes up his position during the night, while the rest of the family repose upon the top. The gorilla and orang-utan also erect similar structures; those of the former being situated but a few yards above the ground, and those of the latter being placed

at an elevation of from twenty to as much as fifty feet from the earth. They are composed of boughs and twigs of trees, as well as the stems of creeping plants, all of which are broken up into varying lengths and laid across one another in a more or less haphazard manner until they form a platform of sufficient strength to support the weight of the animals. It has been said that the orang-utan builds a fresh nest every night, but the majority of zoologists at the present day consider that the available information in support of the statement is not sufficient to prove conclusive, and point out that if such were the case the nests would be far more commonly seen than they are.

The only known instance of an orang-utan's nest having been built in this country was when 'Jacob,' one of the inmates of the apes' house at the London Zoological Gardens, managed to escape from confinement. He succeeded in doing this by breaking, with the aid of his fingers alone, some small pieces of the thick wire netting with which his cage was partly constructed, and afterwards proceeded to untwist the interlacing strands until an opening was made of sufficient size to allow his bulky form to pass through. To give some idea of the extraordinary strength displayed by the ape in the accomplishment of his task, it may be of interest to state that the workmen who were sent to repair the damage had to make use of a chisel and a large hammer in order to sever the wire preparatory to removing and replacing it with thick steel bars. When once outside his

cage, Jacob spent a few minutes roaming about the house, then, picking up a flower-pot containing a growing plant, he hurled it through a plate-glass window, seized the wooden window-frame in his hands and, with consummate ease, broke it to pieces ; after which he passed through the opening thus made, climbed upon the roof of the building, and from there proceeded to a tall tree which happened to be close by. Finding this situation to his liking, Jacob commenced to build a nest for himself amidst the branches by breaking off the boughs within his reach and placing them across one another, and, having completed the work to his satisfaction, he settled down to rest after his labours. The nest, a photograph of which is here reproduced, was finished within the course of about ten minutes. In the meanwhile his escape had been discovered, and the authorities at the Gardens, together with a number of keepers who were supplied with lanterns—for it was a dark November day, and about 8 o'clock in the evening—endeavoured by various means to induce him to return to his cage. But Jacob had no wish to leave his new quarters, and as the men were unable to force him to do so, they surrounded the house and tree, and settled down for a night's vigil. After some time, however, the ape, probably feeling somewhat cold in the open air after the accustomed warmth of his old home, left the nest and ensconced himself within the shelter of a large ventilator situated upon the top of his house, and, to cut a long story short, ultimately entered his domicile

once again, when he was promptly made a prisoner.

For other examples of the monkey family which construct nests, we must turn our attention to those ranking as the lowest of the family, for, curiously enough, none of the intermediate types follow the example of the aforementioned man-like apes in their nest-building habits. Of the large group of creatures known as lemurs, which claim kinship with the typical monkeys, certain species, called mouse-lemurs, make nests amidst the branches of the trees wherein they dwell during the daytime. Coquerel's mouse-lemur constructs a domicile composed of twigs, leaves, and grasses, and measuring about eighteen inches across; and the dwarf mouse-lemur, which claims the distinction of being the smallest of its kind, and only attains to a length of four inches, exclusive of its tail which adds another six inches to the total, makes use of hair for the purpose of lining its nest.

Some of the mouse-lemurs undergo a period of æstivation, and lie dormant during the hottest time of the year. Before commencing their long sleep the creatures feed up and prepare themselves for their long fast; the amount of fat they thereby add to their bodies being mainly stored up at the root of their tails, which become swollen to an abnormal degree. The fat is gradually absorbed into the animal's system during the time it remains dormant.

The galagos, near relatives of the lemurs, also make nests, although it is believed that only the smaller kinds resort to the practice. Of the various

different species, the largest is as big as a cat, while the smallest is hardly as large as a rat. All of them have the curious power of being able to partly fold up their enormous ears—in all probability as a means of protecting those delicate and sensitive organs from being torn or damaged by the branches or twigs of the trees. Nocturnal in habits, the galagos, found in many parts of Africa, dwell amidst the dense forest regions and spend the daytime within the shelter of their nests, or else hiding among the leaves of the cocoa-nut palms.

The great, grand or thick-tailed galago, one of the larger kinds, is spoken of by the Portuguese settlers in Zambesi as the 'rat of the cocoa-nut palm,' owing to the wonderful agility it displays when jumping from tree to tree. But in spite of its powers in such respect the creature is not a difficult one to capture, for, by taking advantage of its pronounced liking for palm wine, it is only necessary to leave a jar of this favourite beverage within its reach, and then wait until the animal has feasted thereon—not wisely but too well.

The remarkable-looking creature known as the aye-aye (*Chiromys madagascariensis*) is yet another nest builder, Monsieur Soumagne, who appears to have been the first to discover the nests, describing them as ball-shaped structures of enormous size which measure about two feet in diameter. They are usually made with the leaves of the travellers' tree and lined with twigs and leaves.

Found only in Madagascar, few animals have given rise to more controversy than the aye-aye

since it was first brought to the notice of zoologists in the year 1780 by the French traveller and naturalist, Pierre Sonnerat. He considered it to resemble a squirrel in many ways, although in other respects showing similar characters to those of the lemurs and monkeys. Both Buffon and Cuvier were also of the opinion that the creature was a kind of squirrel, and therefore considered themselves justified in classifying it among the family of rodents.

More modern investigation, however, revealed so many peculiarities in the animal's structure that it was finally regarded as a distinct genus, of which it was the sole representative.

The reason for assuming the aye-aye to be a rodent was owing to the nature of its teeth, the incisors being square or chisel-shaped at their extremities, and faced with a layer of hard enamel. The tusks or eye-teeth, moreover, are absent, and the molars or cheek-teeth are separated from the incisors by a considerable space—features all of which are characteristic of the rodent tribe. Such being the case, it was not surprising that the animal should have been placed among the rodentia, and for a considerable period it remained among that order in zoological classification. All previous opinions, however, were set at naught in after years by the discovery that the dentition of the young aye-aye was quite different to that of the adult, and more closely resembled that of the lemurs.

Another important feature in which the animal resembles the lemurs, thereby proving that it cannot claim affinity with the rodents, resides in the fact

that the great toes of the feet are opposable to the remainder. With the exception of the great toes, which possess flat nails, all the digits are furnished with claws—that upon the middle finger of either hand being of exceptional length, and of such slender proportions as to resemble a wire. These attenuated claws are used by the creature when searching for its food, first of all as an instrument for tapping against the branches of trees in order to discover if any larvæ of beetles or other forms of insect life are hidden within, and, secondly, as a probe for removing them from their hiding-places when once they are discovered.

In addition to a diet of grubs, the animal also feeds upon sugar-cane and the pith of bamboos, while those that the writer has known would readily feast upon an orange or a marrow-bone.

When negotiating the former, the creature would first of all bite a hole through the skin of the fruit and then draw out the contents into its mouth by means of its long claw—little more than a hollow sphere remaining when it had finished its meal.

A fully-grown aye-aye may be compared in size to a domestic cat. Its long and coarse fur is mostly dark brown in colour, but that upon the large and bushy tail is almost black. The creature's short and round head is surmounted by a pair of enormous forward-directed and upstanding ears which are almost destitute of hair, while the large and staring eyes are other features that add to the animal's almost repulsive appearance.

Nocturnal in habits, the aye-aye spends the

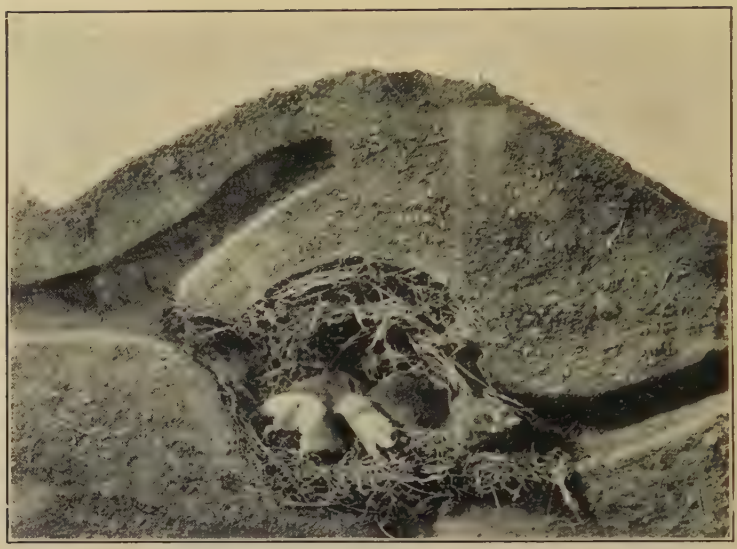
daytime asleep within its nest amidst the dense parts of the forest. It is a rare animal, and very few have been seen in this country. The natives are very afraid of the creature, believing that it has the power to destroy those who endeavour to trap it or to do it an injury. The late Mr. Lydekker, quoting Mr. L. Baron, tells us that :—' It is only a few of the more daring spirits among them, who knowing the *odiny*, that is the secret by which they can disarm it of its dreaded power, who have the courage to attempt its capture. Now and then it is accidentally caught in traps which the natives set for lemurs ; but the owner of the trap, unless one of those versed in the aye-aye mysteries, who knows the charm by which to counteract its evil power, smears fat over it, thus securing its forgiveness and goodwill, and sets it free.'

By far the most proficient of all the four-footed nest builders is the harvest mouse, a tiny creature which, with the exception of the pigmy shrew, is the smallest mammal found in Great Britain.

It measures only two and a quarter inches in length from the tip of its nose to the root of its tail —the latter appendage being two inches long— and in weight turns the scales at one-sixth of an ounce. Gilbert White was the first to discover the species in England, and in his famous letters to Thomas Pennant, he wrote :—' They never enter into houses ; are carried into ricks and barns with the sheaves ; and build their nests amidst the straws of corn above the ground, and sometimes in thistles. They breed as many as eight at a

THE NEST OF AN ORANG-UTAN. [*Page* 122.]

A RAT-KANGAROO—A SPECIES THAT MAKES A NEST. [*Page* 133.]



SECTION OF MOLE'S NEST, SHOWING UNDERGROUND GALLERIES. [*Page* 133.]
(*From British Museum.*)

THE BEAVER, WHICH DAMS RIVERS AND BUILDS LODGES [*Page* 134.]

litter, in a little round nest composed of grass or wheat.' The globular structure, about the size of an orange, receives its support by being interwoven around the straws of corn, grasses, twigs of shrubs, etc. It is only used as a summer residence, for during the winter months the mice burrow underground and remain in a torpid condition until the return of the warm weather induces them to come forth ; but those individuals which may happen to have been carried and deposited in the barns during the ingathering of the harvest remain active throughout the winter.

The common dormouse is another animal indigenous to this country which indulges in the practice of nest building ; indeed, it goes so far as to construct two nests, the one serving for its winter quarters and the other as a summer domicile wherein the young ones are born and reared. Made of grass, moss, leaves and twigs, both structures are globular in form, and are built amidst hedges and bushes, the winter home being constructed during the autumn, and a supply of food being stored therein for the use of the inmates during the cold weather. The dormouse is nocturnal in habits, and feeds principally upon berries, beech-mast, seeds of various kinds, and nuts. It is especially fond of hazel-nuts, and for this reason it is called in Germany by the name of 'Haselmaus.' The creature grows to a length of about three inches, exclusive of its tail, which measures two and a half inches long ; while its luminous eyes are characterised by their large size.

Another of the dormouse family, known as the squirrel-dormouse (*Myoxus glis*), and found in Southern Europe, is an interesting species inasmuch as in olden days the Romans made a practice of keeping and fattening it for the table. It attains to a total measurement of about ten or eleven inches, and receives its name on account of the bushy nature of its tail. Like the common dormouse, the animal constructs a nest for the accommodation of its young; this, however, being situated within the cavity of a tree, in the cleft of a rock, or in the deserted burrow of another creature, but never in the midst of bushes.

A somewhat similar species to the foregoing is the garden dormouse (*Myoxus nitela*), so called because of its habit of frequenting gardens and orchards. The female brings forth her young within a nest which she sometimes makes herself, while at other times the discarded home of a thrush, blackbird, or squirrel may be commandeered.

Even the familiar house mouse is quite an expert in the making of a nest, for by utilising pieces of paper, straw, cloth, leaves, string, chips of wood, etc., which the creature bites up into small pieces, it forms a warm and comfortable bed whereon to repose.

An interesting little beast, known as the jumping mouse (*Zapus hudsonianus*), is to be found in North America. It possesses very long hind legs, enabling it to take a leap covering a distance of as much as eight or ten feet in length. Following the

example of the dormouse, the animal constructs a summer and a winter nest; the former being built within the bole of a tree, or beneath a log or some other similar site, while the latter is situated underground. The white-footed mouse (*Cricetus leucopus*), another inhabitant of North America, also builds a nest, sometimes measuring a foot across, which is frequently suspended from the branch of a tree at an elevation varying from five to fifteen feet above ground, and is composed of moss and strips of bark. In some parts of its habitat, however, the animal makes its home underground.

Many other species of the mouse tribe build nests; the short-tailed field vole (*Microtus agrestis*), for instance, makes a residence, composed of moss and leaves, which is usually concealed beneath a tuft of grass; while the meadow vole (*M. riparius*), of North America, resorts to the curious practice (during the winter months, and in the northern regions of its habitat) of constructing its nest upon the ground and allowing itself to be covered up with snow; the heat which generates from its body melting the under surface of the snow, so that in due course a dome-shaped roof is formed above its shelter.

The aquatic rodent of South America known as the coypu rat, a species which grows to a length of two feet from the tip of its nose to the root of its tail, and is frequently exhibited by showmen in this country as a monster sewer rat, will sometimes erect a platform-like nest amidst the rushes;

but as a rule it dwells within a burrow excavated in the bank of a river.

The musk-rat or musquash is another animal which, although generally dwelling in an underground burrow dug out of the bank of a stream, occasionally builds a residence above ground; this being composed of reeds, grasses, etc., formed into a dome-shaped mass, held together with a plastering of clay, and having its foundation upon a mound of mud so that the summit of the nest is raised above the level of the water which surrounds it. A single chamber, measuring as much as two feet across, is situated within the structure, from which a tunnel-like passage leads to the exit placed below the water.

It is well known that our hare resides in a shallow depression scraped out of the earth, which is known as its 'form'; but the wood-hare of North America, besides fashioning a similar kind of domicile, also makes a nest therein which is constructed of leaves, grasses, and fur obtained from its own body. Upon this soft bed the young ones pass the early days of their existence, being completely covered up and concealed by the mother when she finds it necessary to leave them for a short period.

Many of the squirrels build nests or 'dreys' for the accommodation of their young; the structures being composed of leaves, mosses, and vegetable fibres, and placed in the forked branches of trees or in the cavities within the stems and boughs.

The stoat makes a nest of leaves and grasses

within the bole of a tree ; while the abode of another member of the family, known as the mink, is either concealed within the shelter of a hollow log or else in the bank of a stream.

One would hardly expect a kangaroo to indulge in the habit of making a nest, but some of the smaller species, termed rat-kangaroos, resort to that practice and excavate hollows in the ground and form nests therein which are composed of grasses. When carrying the material used in the making of their homes, the animals utilise their prehensile tails as a grasping organ, and curl the extremities thereof in a downwards direction around the grasses. Even when living in a captive state, the writer has known a pair of these creatures to make a nest in their enclosure, and so carefully did they cover themselves up when once inside that an observer would merely imagine that he was gazing upon a stray heap of litter.

Other marsupials which make nests are the long-snouted phalanger, a little animal no larger than a house mouse in size, and a species of American opossum known in scientific nomenclature as *Didelphrys crassicaudata*, which, according to Mr. Hudson, 'sometimes constructs globular nests suspended from rushes.'

No account of mammalian nest builders would be complete without mentioning the mole and the beaver, both of which display great ingenuity in the planning and making of the homes wherein their nests are situated. Although the underground domicile of the former creature, commonly called

its 'fortress,' is of a very complicated nature, yet, notwithstanding the popular belief, it is not constructed with the geometrical exactitude that has so frequently been described. Neither do mole-hills necessarily indicate that a nest is situated underneath, for the little heaps of earth are thrown up at intervals by the animals during their progress in search of food. The dwelling-place of the mole consists of a central chamber about the size of a football, from whence passages or galleries run in various directions; one of them, known as the 'bolt-run,' which leads downwards from the bottom of the inner sanctum and then rises upwards and joins another gallery leading to the field above, being utilised by the creatures as a way of escape in times of danger. The nest itself, made within the central chamber, is composed of grass and leaves. Each mole, except in the case of a female with young, dwells in solitude within its own habitation, and, consequently, the animals have the name for being of a very unsociable disposition. Possibly, however, they are somewhat unjustly maligned in such respect, for, after all, a crowded domicile would not be conducive to a happy state of existence, and if two moles should happen to meet one another face to face in one of the narrow galleries, and each individual was determined to continue its progress in a forward direction, the situation thus brought about would be likely to give rise to dispute and loss of temper.

Beavers exhibit even greater sagacity and constructive ability in the making of their habitations

than the moles, for not only do they excavate burrows, but they build 'lodges' and also erect barriers or 'dams' across rivers and streams. The lodges are of two kinds, one of them, known as the 'bank-lodge,' being placed quite close to the subterranean burrow and forming a kind of annexe thereto; and the other, termed simply the 'lodge,' being built in mid-stream. They are composed of logs, branches, and brushwood, and take the form of large oven-shaped mounds measuring from six to eight feet in height, and, occasionally, twenty feet across. A commodious compartment, sometimes having a diameter of as much as seven feet, and a height of two or three feet, is situated within, access to the same being obtained by several underground passages which lead therefrom and open under water. The animals render their homes watertight by plastering mud upon the thick and strong outer walls with the aid of their fore-paws, and cover the floor of the inner apartments with a carpet of grasses, chips of wood, and the bark of trees.

In order to keep the water surrounding their habitations at a more or less constant level, thereby ensuring that the structures are not left high and dry in times of drought, the beavers sometimes erect dams across the streams, which may measure as much as one hundred and fifty to two hundred yards in length. They are made of logs, branches, grasses, roots, and mosses, held together and rendered almost, if not quite, impervious to water by a coating of clay. The creatures obtain the

wood by felling the trees in the immediate vicinity of their abodes with the aid of their chisel-like teeth, after which they cut it up into suitable lengths.

Much credit has been bestowed upon the beaver for the clever manner in which it is supposed to arrange that the trees shall fall into or towards the water, and thus enable the animal the more readily to float them along to their required destination; but, in reality, the reason why they usually drop in that direction is explained by the fact that those which grow upon the banks of streams invariably have a tendency to lean over towards the water, and away from those behind them, so that their branches shall obtain more light, air, and room for their development than they otherwise would do.

CHAPTER IX

ANIMAL PRODUCTS

FEW people realise to what an extent human beings are dependent upon animals for supplying their daily needs, or how difficult it would be to carry on the industries of the world without them. The food supply which they yield in the form of meat, poultry, fish, milk, eggs, etc., is of primary importance; and although it is a much-debated question as to whether it would not be a more desirable practice for mankind to be contented with a vegetarian diet, yet in our review of the various products which are obtained from the different members of the Animal Kingdom we will base our remarks upon the existing state of affairs. In dealing with this part of our subject, however, we do not propose to enter into a discussion regarding the relative value of beef or mutton, or whether chickens are more nutritious when boiled than when roasted, but rather to inquire into the more curious forms of food which appeal to the palate of divers people throughout the world, and concerning which remarkable beliefs are sometimes held.

Few of my readers would appreciate a tiger steak for his dinner, but, nevertheless, the natives of the Malay Peninsula are said to be very fond of the flesh of that animal, and believe that by eating it they thereby receive the qualities of courage and sagacity, as well as immunity against disease. We are told also that the natives of Guatemala are (or were) in the habit of eating live lizards as a cure for cancer. Many kinds of monkeys are greatly esteemed as an item of diet by the natives of Africa, Ceylon, and South America—the species mostly in favour in the latter country being the spider, saki, woolly, and howler monkeys —and although few Europeans are sufficiently courageous to sup upon such a fare because of the resemblance of the creatures to human beings, yet those who have tasted their flesh speak favourably of it, and Mr. Wallace writes :—' Having often heard how good monkey was, I had it cut up and fried for breakfast ; the meat somewhat resembled rabbit, without any peculiar or unpleasant flavour.'

Amongst other curious animals that are eaten by mankind, mention must be made of a species of large bat or flying-fox which, although notorious for its unpleasant odour, is stated to taste like hare or partridge ; while certain of the Arab tribes do not disdain to feed upon the flesh of the hyæna. The North American Indians eat the flesh of the coyote or prairie-wolf, and in the Southern States the list of animals used as food includes the sloth, the puma, the agouti, the paca or spotted-cavy, the viscacha, the capybara or carpincho (the

largest of all rodents), the peccary (a small species of pig), the tapir, the armadillo, the great ant-eater, and guinea-pigs.

According to the writings of Mr. Simmonds, the bill of fare of the Italian people is a somewhat strange one, for the author states :—'They eat foxes in Italy, where they are sold dear, and thought fit for the table of a cardinal,' and that 'the flesh of the porcupine is said to be used . . . as a stimulant,' the latter dish being prepared by first of all boiling it, and then roasting it. Robins serve also as food in that country, as well as the fat-dormouse (*Myoxus glis*). In Germany, the paws, tongues and hams of bears are regarded as a delicacy ; while the flesh of the white or polar bear is eaten by the Esquimaux.

One would hardly expect rats and mice to figure upon a bill of fare, but the authority previously quoted tells us that :—'The mouse, to the Esquimaux epicures, is a real *bonne bouche*, and if they can catch half-a-dozen at a time, they run a piece of horn or twig through them in the same manner as the London poulterers prepare larks for the table, and without stopping to skin them . . . boil them over a fire.' Mice and rats are eaten also by the Australian aborigines, and the Chinese prepare a soup from the flesh of the latter which is stated to vie with that made from ox-tail. In olden days, dog flesh was served at the table of the Greeks and Romans, and even at the present time it is a popular dish with the Chinese people, who feed the animals entirely upon vegetables. The Australian black

men eat the flesh of the wild dingo-dog, and, when pressed by hunger, they will partake of such unappetising items as the larvæ of white-ants, lizards, and even snakes. The common phalanger, or opossum, as it is frequently called, also proves an acceptable dish, and in New South Wales the wombat is considered to be quite a tasty morsel.

The flamingo was greatly appreciated by the Romans, who regarded the tongue of the bird as a special dainty; and we are told that the tongue of the sea-lion is considered by some sailors to be preferable to that of an ox. The peacock was frequently served at banquets in the days of our ancestors, the skin of the bird, with the feathers attached, being carefully removed before the flesh was roasted, only to be replaced, however, when that process was completed, and, finally, to give an artistic finish to the dish, the tuft of feathers upon the head was then gilded.

Dried flesh of various kinds forms a food which is invaluable to travellers and explorers; that known as *biltonge* being greatly favoured by hunters in South Africa, while in colder regions it is superseded by *pemmican*, which is prepared by pounding up the dried flesh of different animals and soaking it in fat. The latter is stated to have quite an agreeable flavour, and to contain four times as much nourishment as that found in an equal quantity of ordinary meat.

Turtle soup is familiar to all of us (if only by name) on account of its associations with the famous Guildhall banquets in the City of London,

and it is interesting to note that the creature which supplies that beverage was first introduced into England as an article of food during the middle of the seventeenth century. The species which is used for converting into soup is the green-turtle ; but in other countries the flesh of the matamata terrapin, the gopher tortoise, the trionyx or soft water-tortoise, and the box tortoise is occasionally eaten. The large lizards known as iguanas are served at table in South America, and are said to taste like chicken ; while in Mexico the flesh of the salamander-like creature called the axolotl is much appreciated as food.

Many insects and grubs (especially those of beetles) are eaten by the inhabitants of different parts of the world ; locusts being considered great delicacies in Arabia, and in West Africa the goliath beetle is roasted and served at table. In Turkey the women fry and eat a species of beetle (*Blaps sulcata*) ; and we read that the African Bushmen do not disdain caterpillars and spiders as items of their diet. Humboldt reports having observed the children of the South American Indians capture giant centipedes—which frequently measure as much as eighteen inches in length—and devour them with relish ; while the Chinese eat young live crabs, which are served at table in covered dishes, but when the lids are removed the crustaceans commence to run about in all directions, only to be grabbed at, however, by the guests, and popped into their mouths.

The chrysalides of the silk-worm moth are eaten

also in China, after the silk has been wound off from the cocoons which surround them.

The eating of snails and frogs is quite a common practice in some countries at the present day, and the former creatures were much esteemed as an article of diet by the ancient Romans who fattened them upon bran which had been soaked in wine. The edible frog is found throughout the greater part of Europe, and also in North-West Africa and West Asia, but in the British Isles its distribution is now confined to Norfolk, although formerly it was plentiful in Cambridgeshire. According to Mr. E. G. Boulenger, no less than 80,000 francs are spent by the populace of Paris upon these dainties during the course of a year ; the best kind coming from the Department of Vendée, where miles of ditches have been dug for their accommodation. The common frog is used also as food by the Parisians.

We are all of us familiar with the prettily-coloured and translucent jellies which tempt our jaded appetites towards the end of a meal, and are probably under the impression that they are prepared from isinglass or from the gelatine obtained by boiling down the feet of cows and calves. Although in the majority of cases we may be quite correct in regard to our supposition, yet it is as well to bear in mind that not all jellies are made therefrom, for a great deal of inferior gelatine is extracted from such items as parchment shavings, bones, and hide clippings ; while ivory dust also forms a basis from which that dish can be prepared.

Isinglass, the purest form of gelatine, which is obtained from the sturgeon and other fish, is used in the production of the best jellies, and also for giving a stiff consistency to jams. When dissolved in pure alcohol it forms a diamond cement, and when incorporated with strong acetic acid a cement is obtained which is greatly in demand for repairing pottery and glassware.

It is also mixed with lamp-black and Spanish liquorice to produce an Indian ink, and when gum is added to it, it serves as a dressing which gives a lustrous sheen to silks and ribbons. Court plaster is yet another product in which isinglass is utilised, the gelatine being mixed with a small quantity of tincture of benzoin, and then spread over sarsenet and left to dry. It is used also for the purpose of clarifying wine and beer. Size and glue are inferior grades of gelatine, the former being prepared from parchment clippings, pieces of leather, rabbit skins, and even such items as old gloves, while glue is obtained by boiling down the skins, hoofs and bones of mammals, as well as from the skins of fish and from the dried swimming-bladder of the cod.

The skins of animals are used for many purposes, and those creatures which possess a thick covering of hair are greatly in demand for supplying the various furs used for making into cloaks, muffs, stoles, rugs, etc. Leather is prepared from the hides of animals, and parchment is manufactured from sheepskins; while that form of the latter product known as vellum, which is characterised

by its elasticity, strength, and smoothness of texture, and used in the making of drums, tambourines, banjos, etc., is obtained from the skins of kids, lambs, and calves. In Siam, the natives make use of the skin of the elephant-trunk snake in the construction of drums.

That useful household commodity called wash-leather or shammy-leather—the latter term originating from the word 'chamois,' from which creature the leather was formerly obtained—is produced from the skins of sheep, deer, oxen, etc.; and the porpoise hide of commerce which is frequently sold in the form of boot-laces is, in spite of its name, prepared from the skin of the beluga or white whale. The skin of fish, besides being converted into glue, is also utilised for other purposes; that of the sharks and rays being manufactured into a granulated leather known as shagreen, while the rough skin of the angel-fish is used for producing a polish upon wood and ivory. Eel skins are also occasionally manufactured into the lashes of whips.

Certain of the internal parts of animals are turned to account by mankind for his use, and the so-called catgut, which is made into strings for musical instruments, is produced by drying and twisting up the intestines of sheep, and, occasionally, those of horses and asses; while gold-beaters' skin is prepared from the thin outer membrane of the intestine of the ox, and used by gold-beaters to place between the layers of metal while they beat it into the required thickness. Another

THE WOOLLY-MONKEY, WHICH IS EATEN BY THE NATIVES OF S. AMERICA. [*Page* 138.]

THE GREEN TURTLE, FROM WHICH THE FAMOUS SOUP IS MADE. [*Page* 144.]

A RORQUAL, ONE OF THE WHALES THAT YIELDS WHALEBONE. [*Page* 149.]

THE RATTLESNAKE, WHOSE POISON IS USED TO CURE YELLOW FEVER. [*Page* 157.]

internal animal product is gall, which is a bitter-tasting fluid secreted by the liver; that obtained from the ox being used by artists in conjunction with water-colour paints, while the gall from the carp is used by the Turks as a green pigment. The commodity known as ivory-black, which is prepared by calcifying ivory refuse, is used also by artists in the form of a paint, and sepia is a brown pigment prepared from the fluid secreted by the glands of the cuttle-fish, a creature that yields also the cuttle-bone of commerce (an internal calcareous plate taking the place of a backbone) which, when finely powdered, is used as a tooth-powder, and, under the name of pounce, was formerly employed to absorb the surplus moisture of wet ink, until its use was superseded by blotting-paper.

The bright red dye known as carmine is obtained by boiling the dried bodies of cochineal insects in water, and then adding some alum in order to precipitate the colouring matter (about seventy thousand of the creatures being required to make one pound of the commodity); while in former days the insects were used as a medicine for the treatment of whooping-cough. A very useful varnish, known as lac, is obtained from the small *Coccus lacca* insect; and we read in *Cassell's Natural History* that 'the dye used in the manufacture of the celebrated "Tyrian purple" of the ancients was obtained from certain species of Murex. The small shells were bruised in mortars and the animals of the larger ones were taken out.' The dog-winkle (*Purpura lapillus*) yields a white fluid

which, under the influence of air and light, undergoes a transformation of colour and changes to various shades of blue, green, and yellow. In former days it was used as a dye.

The bones of animals, besides yielding a weak form of glue, are also used in the production of charcoal which, when pulverised into a fine powder, is known commercially as bone-black and is largely utilised in the manufacture of printer's-ink, boot-blacking, and for decolorising syrups. The inhabitants of the Pacific Isles convert the wing-bones of the albatross into tobacco pipes; and Fitzstephen, in his *History of London*, tells us that it was customary in the twelfth century for the young men to fasten the leg-bones of animals under their feet by means of thongs, and then slide over the ice by pushing themselves along with iron-shod poles. Ammonia is a product which is sometimes prepared from bones and horns; and albumen or the white of egg is a useful commodity used in photography, in the industry of calico printing, and for sugar refining.

As a fertiliser of land, the substance known as guano (the accumulated and decomposed droppings that sea-birds, such as gulls, cormorants, and penguins deposit on many islands in the Pacific Ocean, and also that of the bats which inhabit the caves of the Southern States of South America) is very valuable to the agriculturist; while the rotted bodies of fish, as well as the ground-up shells of oysters, are other forms of manure which are highly beneficial when used as a dressing for the soil.

Fish scales have been used for making artificial flowers; the quills of porcupines serve to decorate the dresses of the Red Indians, and are also used as fishing-floats and as penholders; while the larger plumes of such birds as geese, turkeys, swans, etc., are converted into tooth-picks and quill-pens. The plumage of birds is also in great demand for the purpose of decorating ladies' hats, etc., and even our pillows and mattresses are filled with feathers and down.

From the sheep we obtain wool; from the horse we get the hair which is used in stuffing sofas, chairs, and mattresses; while paint brushes are made from the stiff bristles of the hog, as well as from the hairs of the sable and the polecat or fitch. Camel-hair brushes, it may be mentioned, are not made from the animal of that name, but usually from squirrel hair. They receive their name from a Mr. Camel, who was the first to manufacture them. Badger hair is frequently used in the manufacture of shaving brushes; and in the East the long flowing tail of the yak is utilised for the purpose of a fly-whisk or chowry.

Oil is obtained from many kinds of animals, and that from the blubber of various species of whales is known commercially as train oil, and used largely as a lubricant for machinery, in the dressing of shammy leather, and in the process of wool-combing. Neat's-foot oil is obtained by boiling down the feet of cattle, and an excellent lamp oil has been prepared from the bodies of cockchafers, which yield also a grease that is used in Hungary for lubricating the

wheels of carriages. The fat extracted from wool is nowadays purified and used for various purposes under the name of lanolin. Oil is obtained even from the eggs of a species of water-tortoise or terrapin, which inhabits the rivers of Tropical America, and Mr. Bates, in his book *The Naturalist on the Amazon*, tells us that about 18,000 gallons of oil were obtained from these creatures and exported from the Upper Amazon every year, even after the inhabitants had reserved 6,000 gallons of the fluid for their own use, the total yield representing the product of some forty-eight million eggs. The oil was extracted from the eggs by breaking up a large number of them in a trough, and after stirring the liquid mass and then leaving it exposed to the rays of the sun, the oil would collect upon the surface, when it was skimmed off, placed in receptacles, and, finally, boiled over a fire.

In former days it was the custom to catch rattlesnakes in order to obtain their fat and convert it into oil, and regular hunting expeditions were arranged for that purpose, the reptiles being traced to their winter sleeping-quarters, where they used to congregate in immense numbers. Mr. Catlin records a curious incident in connection with one of these hunts when a rattlesnake, having come forth from its resting-place, was caught and employed as a living bomb by attaching some gunpowder and a time fuse to its tail. It was then sent back from whence it had come, with the result that the explosion which followed proved a far more expeditious method of destroying the colony of reptiles

than the usual one of hitting them one by one upon the back with a club.

A by-product obtained from the oil of the sperm whale and its allies is that known as spermaceti. This is held suspended in the oil during the life of the animals, is found principally in the cavity of the head, but separates into a solid state after the death of the creatures, when it becomes cold. It then undergoes a process of purification or refining, and ultimately issues as a pure white and almost odourless substance which is used in the manufacture of various ointments and for making the candles which serve as a standard of light.

Ambergris is another product of the sperm whale which, although found occasionally in the abdomen of the animal, is usually met with floating upon the surface of the sea, or cast up upon the shore. Most of that which is brought to this country comes from the region of the Bahama Islands, but it is to be found also in the Atlantic Ocean and off the coasts of Brazil, Africa, China, Japan, the East Indies, etc. It is a fatty substance of a general grey colour, broken up with reddish veins running through it in the manner of the markings upon marble, and is believed to be secreted by the bile of the creatures and formed in the intestines. In the East it is used for perfumery, as a flavouring material in cookery, and in pharmacy. Mankind (or should I say womankind ?) is also indebted to certain whales for the supply of the commodity known as whalebone or baleen.

In addition to ambergris, several other animal

products are used in the perfumery trade. The civet, for instance, yields a white fatty substance, contained in two little receptacles or pouches situated under the root of the animal's tail, which was formerly used to a considerable extent in the manufacture of scents, the material being mixed, however, with other ingredients so as to subdue its strong and somewhat objectionable odour.

In order to simplify the operation of extracting the secretion, the animals were kept in small cages which were too narrow to allow of their turning round. About twice a week the 'civet,' as the scent is called commercially, was removed with the aid of a small iron spoon or spatula, the quantity procured at a time varying according to the condition and sex of the animals, although, as a rule, the males yielded about a drachm of the substance and the females somewhat less.

Musk is another material used as a perfume which is obtained from a small bladder-like bag situated upon the abdomen of the musk-deer ; and Tennent states that the Tamils confine the glossy genet in cages for the sake of its scented secretion, collecting the same from the wooden bars upon which the animal rubs itself.

For the production of that beautiful material known as tortoise-shell, our thanks are due to the hawksbill turtle which is found in the tropical and sub-tropical seas and grows to a length of about three feet. The shell of this creature was employed by the ancient Romans for adorning furniture, and in the days of Augustus it was the custom for

the patricians to use it for decorating the doors and the columns of their apartments. The previously-quoted authority tells us that in order to obtain the coveted product, the natives of Ceylon resort to the cruel practice of suspending the live turtles over a fire until their shells break asunder from their bony supports; but the present writer believes he is correct in stating that this custom is no longer indulged in, and that the method employed in other countries, namely, that of killing the animals and removing the tortoise-shell by the agency of hot water, or by burying the carcases under the hot sand and leaving them there for a period of seven or eight days, is now universally followed.

Ivory has always been regarded with favour as a material for decorative purposes, for converting into knife handles, paper knives, billiard balls, etc., and, as previously mentioned, forms also the basis of the pigment known as ivory-black. The best ivory is obtained from the tusks of elephants; but the walrus, the hippopotamus, and the narwhal also yield a supply. Horn is yet another animal product which is used in the manufacture of various domestic articles.

From the bee we obtain a nourishing food in the form of honey, as well as a useful commodity in the form of wax; but the latter substance, however, is also obtained from the wool of sheep during the process of scouring. The larvæ of the silk-moths give us a supply of silk which they spin into cocoons around their bodies before changing

into the chrysalis state, and that obtained from the mulberry silk-worm (*Bombyx mori*), a species which is doubtless familiar to my readers, forms the principal source of the world's silk supply. According to *Cassell's Natural History*: 'The silk-worm was originally a native of China, and Chinese historians attribute the discovery of the use of silk to the Queen of the Emperor Hwáng-té, who lived about 2640 B.C., and the rearing of silk-worms formed one of the principal duties of the queens and ladies of the court for many centuries afterwards. . . . The silk-worm was first introduced into Europe in the reign of Justinian by some missionaries, who smuggled the eggs to Constantinople concealed in canes.'

In former days, the byssus or silky filaments by means of which certain species of the pinna (a kind of oyster) attach themselves to objects used to be woven and made into gloves, stockings, etc., but the material proved too expensive for general use, and too warm for ordinary wear. In the Natural History Museum at South Kensington, some of this molluscan silk can be seen in both the natural and manufactured conditions.

Pearls, as we all know, are obtained from certain oysters and a species of water mussel (*Mytilus cygnus*), but the ancients believed that they were formed from dew-drops which had been subjected to some remarkable influence proceeding from sunbeams. They are an abnormal rather than a normal production, inasmuch as they are only formed by the molluscs in order to cover up some

irritating substance which causes them discomfort. Linnæus, the Swedish naturalist, was the first to make this fact known, and for the purpose of establishing the truth of his discovery he inserted some pieces of wire through the shells of some oysters, with the result that, in due course, they became covered with a calcareous and pearly deposit. The Chinese have taken advantage of this discovery, and make a practice of introducing little metal figures (usually representing Buddha in a sitting position) between the shells of oysters, which, when coated with the pearly substance, are sold to the populace as charms. The pearl-oysters also yield the material known as 'mother-of-pearl,' which is used largely in the manufacture of buttons; and the large transparent shells of a certain oyster form a substitute for glass in Southern China and India. Mr. Simmonds tells us that the shells of oysters, mussels, and snails are used as drinking vessels, spoons, etc., by many savage people, and, in New Zealand, they are sharpened and employed as razors. The natives of the South Sea Islands convert them into fish-hooks, and, in North America, harpoons are often tipped with sharp pieces of mussel shell. Cowry shells take (or used to take) the place of money in many parts of Southern Asia —their value being roughly estimated in comparison with our coins at the rate of 4,000 to the shilling. It is recorded that a church, which cost £4,000 to erect in the East Indies, was entirely paid for with cowry shells, of which about 36,000,000 were required to pay the wages of the workmen.

Conch or Triton shells are used in the East and West Indies as trumpets or horns, and Mr. Ellis, in *Polynesian Researches*, states that the noise produced by 'a species of murex (*Triton*) used by the priests in the temple, and also by the herald and others on board their fleets, was more horrific than that of the drum. The largest shells were usually selected for that purpose, and were sometimes about a foot in length and seven or eight inches in diameter at the mouth. In order to facilitate the blowing of this trumpet they made a perforation, about an inch in diameter, near the apex of the shell; into this they inserted a bamboo cane, about three feet in length, which was secured by binding it to the shell with finely-braided cinet. The aperture was rendered air-tight by cementing the outsides of it with a resinous gum from the bread-fruit tree. These shells were blown when any procession marched to the temple, at the inauguration of the King, during worship at the temple, or when a tabu or restriction was imposed in the name of the gods.'

In Roman Catholic countries it is frequently the custom to utilise the enormous shells of the clam as receptacles wherein to place holy water; and the cottagers of Zetland use spindle shells (a kind of whelk) as lamps by placing a wick and oil inside. The *objets d'art* known as cameos are carved upon various shells that are characterised by possessing an exterior surface of a different tint to that which lies underneath; those of the *Cassis cornuta* being white on the outer surface and orange beneath; those of *C. rufa*, pale salmon outside

and orange beneath; those of *C. tuberosa*, white outside and claret-coloured beneath; and those of *Strombus gigas*, yellow outside and pink beneath.

The bath sponge supplies us with an indispensable article for our toilet, but the substance as we use it is only the skeleton of the living creature, from which the gelatinous body (somewhat resembling the white of an egg) which fills the porous interior and surrounds the exterior, as well as the horny fibres which add a further support to the skeleton, have been removed. Of the many different kinds of sponges—numbering about 2,000 kinds, and of which some 300 are to be found around the coasts of the British Isles—some are no larger than a pin's head, and others grow to a height of several feet. They vary also the one from the other in regard to their shape, some resembling a cup in form, others being spherical, others tubular, and others assuming the formation of a branched tree. During their life they are often prettily coloured, and although in the majority of cases different shades of yellow and brown are their predominating hues, yet green, pale lilac, indigo, bright blue, rosy red, black, and even white sponges are to be found.

The red coral, formerly so popular for manufacturing into necklaces, is another product for which mankind is indebted to living animals; the material being the hard calcareous substance that tiny marine polyps secrete around themselves as a means of support, and for a habitation. Then, again, the fossil remains of animalcules enter into the com-

position of various stones, and that known as rotten-stone or Tripoli—the latter term arising from the fact that it was originally procured from the country of that name—is a red powder which is used for giving a high polish to glass, marble, metals, etc.; while a stone called coral-rag is found in Oxfordshire which owes its formation to coral-polyps. The fine white powder obtained on the shores of a lake in Sweden, and known as mountain-meal by the natives who, in times of scarcity, used to mix it with other ingredients when making bread because of its supposed nutritive value, is yet another substance which has its origin in animal life. It consists entirely of the shell coverings of minute animalcules.

The remains of microscopic creatures are to be traced also in opals, agates, and many flints.

Many animal products were employed in the past to cure various maladies, and we read that red coral was considered by the Romans to have medicinal properties, and was used by them in the form of a necklace to hang around the necks of their infants in order to preserve their teeth and to assure that they became firmly fixed in the gums. In Europe, finely-powdered cowry shells formerly served as a remedial application for sores. The gall of bears is used medicinally in China, as well as a gelatine prepared from the skins of asses; and the Arabian doctors are stated to make use of a preparation from the skunk as a remedy for elephantiasis, leprosy, and other skin diseases. Even at the present day the medical fraternity are indebted to

animals for some of their medicines, and in Homœopathic treatment the following agents are used: *Castoreum*, a secretion of the beaver, is useful for certain nervous affections, and *Moschus*, a secretion yielded by the musk-deer, is a nerve stimulant; while *Mephites*, a product from the skunk, is valuable in cases of whooping-cough. Many snake poisons are employed in a dilute form as medicines, that obtained from the rattlesnake (*Crotolus*) being used in the treatment of yellow fever, and that from the Indian cobra (*Naia tripudians*) as a heart remedy. *Lachesis mutus* (the bushmaster) is another snake which yields a poison used in certain cases of heart trouble, and for diphtheria; while *Elaps corralinus*, a dilution of the poison of the coral snake, has a marked action upon the eyes, and is also used as a cure for deafness. The poison of the bird-eating spiders (*Mygale*), as well as that from the Spanish and Cuban tarantulas, is used in certain cases of nervous affections, and that from another spider (*Theridion*) for giddiness. *Apis*, the poison of the bee, is utilised for brain trouble; and *Vespa*, the venom of the wasp, and *Formica*, the poison of the ant, are other remedial agents employed for various purposes. Several of the molluscs are used in the practice of Homœopathy, a solution secreted by the lobster serving as a medicine, while *Asterias rubens*, a product prepared by pounding up the common starfish, is useful in some forms of cancer.

Pepsine is another medicinal animal-product, which is obtained from the stomachs of sheep,

calves, and pigs; and *Blatta orientalis*, a product from the cockroach, is used in cases of dropsy. Last, but not least, must be mentioned the world-famed medicine, *Oleum jecoris aselli* with which we are all so familiar under the name of cod-liver oil.

CHAPTER X

THE OFFENSIVE AND DEFENSIVE WEAPONS OF ANIMALS

NO matter how much we may depreciate or repudiate the maxim that 'might is right,' yet, notwithstanding, there can be no doubt that the possession of fighting weapons, and the ability to wield them, enables all living creatures, both human and otherwise, to assert their rights in a manner which, to say the least, commands respect; and, to quote the words of Lowell :—

Twun't du to think thet killin' ain't perlite,—
You've gut to be in airnest, ef you fight.

Although mankind has devised many instruments for offensive and defensive purposes, yet without them he is very badly provided with fighting weapons in comparison to those which Nature has bestowed upon the vast majority of the lower members of creation. The teeth of human beings, for instance, are not adapted for tearing and rending asunder as are those of many other mammals; while the nails are but puny instruments when

compared to the claws of beasts and the talons of birds.

The elephant, the walrus, the narwhal, many wild pigs, and certain of the deer family, all possess exceptionally-developed teeth, known as tusks, projecting from their jaws. These, which in some instances are prolonged incisors and at other times canines, may arise from either the upper or lower jaw of their owners, or even from both, while, moreover, their presence may be common to both sexes, or merely confined to the males. The elephant is the best known of the tusk-bearing creatures, but it may be as well to state that, in spite of the general belief, its chief weapons are not its tusks but its fore-feet; the former being utilised more for the purpose of uprooting trees and as a means of support when the creature is engaged in lifting or carrying heavy objects, although, of course, they can be used for defensive and offensive purposes when the need arises. It must not be imagined, however, that an elephant strikes out with its feet when attacking an enemy, for its limbs are far too heavy to allow it to indulge in such a strenuous form of exercise. It employs them as battering-rams with which to pound and crush the life out of an enemy, and in the accomplishment of this deed its trunk serves as a grasping organ and enables the beast to pin its victim to the ground.

The tusks of the walrus are very formidable weapons, more especially those of the males, which are stouter and stronger than those of the females. They frequently project from the gums for a length of

twelve or fifteen inches, and have even been known to attain to a length of thirty-one inches inclusive of the portion embedded in the socket. Those of the young walrus do not develop until the animal is about two years old, and during that period the infant is nursed by its mother, who frequently gives it a ride upon her back.

The only natural enemies that the walrus has to contend against are the polar bears and the killer-whales; but mankind in his quest of the ivory, skin and oil that it yields, has hunted the animal so mercilessly that it has ceased to exist in many parts where it was once plentiful. Although the ivory obtained from the tusks is of an inferior quality to that procured from the elephant, yet the skin, which may be as much as one and a half inches in thickness, is very valuable and utilised for the purpose of making boot-soles and harness.

Found in the northern seas amidst the ice-bound regions, walruses associate in large herds, congregating upon the ice-floes in close fellowship with one another. They feed upon clams and other kinds of shell-fish—more especially those known as gapers—star-fish, sea-urchins and sandworms. They also swallow a certain amount of seaweed which, in all probability, gets conveyed down their throats involuntarily, and is not specially selected as an item of their diet. When searching for their food the animals employ their tusks as rakes, and when landing upon the shore or ice-floes they will also make use of them as grappling-irons.

Walruses are not often seen in captivity, and the

first ones exhibited in this country arrived at the London Zoological Gardens in 1817. Their span of life, however, was of a very brief duration, both of the animals dying before two months had elapsed. Since then several others have arrived, but none lived for long.

The narwhal or sea-unicorn is a remarkable animal inasmuch as the female is entirely unprovided with teeth, except for those which it possesses when first born and sheds almost immediately afterwards. Even the male passes through a toothless stage during its early life, but as it grows up two new teeth are developed. One of these pierces through its upper lip and ultimately forms a straightly-aligned, spirally-twisted, and tapering tusk which attains to a length of seven or eight feet; while the other one usually remains within its socket and does no' even pierce the gum. Occasionally, however, individuals have been known to possess two tusks. Many suggestions have been put forward as to the exact utility of this enormous tooth; some authorities believing that the narwhal makes use of it for spearing the fish upon which it feeds; others stating that it serves as a weapon when the creature is engaged in combat with its fellows for the possession of the females; while it has been further suggested that it is employed for the purpose of making cavities in the ice to serve as breathing-holes—for, being a mammal and not a fish, the animal is unable to remain under the water for any length of time without coming to the surface for a supply of air. It is a known fact that narwhals

do resort to breathing-holes in order to inflate their lungs with air, but whether the beasts break the ice on their own account is a question that still remains to be solved.

Amongst the members of the deer family which are provided with large upper canine teeth or tusks are to be numbered the muntjacs or barking-deer, the musk-deer, and the chevrotains or mouse-deer; although, strictly speaking, the latter are not true deer but are classified in a separate family. It is only in the males, however, that the tusks attain to a sufficient size so as to project beyond the mouth.

As we have a somewhat wide field to survey under the heading of our chapter, we must postpone to a future occasion more detailed remarks concerning the teeth of these and other creatures, for, in spite of the general opinion that the study thereof is of a 'dry-as-dust' nature, and only of interest to the advanced zoologist, yet, in reality, such is by no means the case. Before we pass on to another theme, however, mention must be made of the formidable dental weapons possessed by many snakes in the form of poison-fangs, to which further reference will be found in these pages.

The vast majority of the hoofed animals or ungulates are well provided with the means of defence and offence. The horses, asses, and their kindred, for instance, are experts in the art of kicking with their hind legs; the deer will make use of their fore-feet for the purpose of striking out at an adversary; while the giraffe is able to inflict a hard blow by swinging its head against the body of an

enemy. A large number of the various members of the order possess horns, varying considerably in shape and structure in the different groups and species into which the ungulata are divided. Those of the oxen, sheep, goats, and antelopes take the form of sheaths which are supported by, and slip over, bony cores arising from the skulls of their owners ; while those of the deer, more correctly termed antlers, are solid throughout and each one rests upon a short bony prominence or pedicel situated above and behind the creature's eyes. Then, again, the so-called horn of a rhinoceros is of quite a different nature and has no connection with the animal's skull, but is composed merely of a mass of tightly-packed, horn-like fibres which arise from its skin.

In the case of wild oxen the horns are present in both sexes ; although in domesticated races they are frequently absent, as exemplified by the well-known Polled Angus breed. As a rule they diverge outwards from their bases and then project upwards ; but those of the musk-ox, however, are exceptional, inasmuch as they curve abruptly downwards from the top of the creature's head and follow the contour of the sides of the face until they reach the level of the eyes, when they take a sharp upward and forward twist. With the adult males they expand at their bases into wide and flat masses, almost meeting at their inner edges and forming a protecting armament across the animals' foreheads ; a feature which is peculiar also to the Cape buffalo. It must be pointed out, however, that the musk oxen are not true bovines, but more akin to the goats.

In a similar manner to the oxen, both sexes of the wild sheep possess horns, whereas in domestic species they are sometimes absent or may be present in the rams only. Those of wild sheep, however, are much smaller in the females than in the males; but very little difference is to be noted in the dimensions between those of the two sexes in the oxen. Moreover, in the majority of the latter the horns are cylindrical in form, possess a smooth surface, and, as previously mentioned, generally take an outward and upward sweep from their bases; but in the males of the former they are more or less of a triangular shape when viewed in section, are transversely wrinkled throughout their length, and frequently grow in a bold, downward and outward-sweeping spiral curve which may almost, if not quite, form a complete circle.

The most remarkable horns are those possessed by the male Himalayan markhoors, in which those appendages take numerous corkscrew-like twists, the actual number of complete turns varying considerably in different individuals; while in the chamois, one of those creatures which forms a connecting link between the goats and the antelopes, the horns turn over backwards at their tips and resemble button-hooks with their business-ends poised uppermost.

Many varied forms of horns are to be found amongst the numerous types of antelopes. Sometimes they are present in both sexes, and at other times it is only the males which possess them. They are supported by bony cores which are almost solid

in structure, instead of being honeycombed like those of the sheep, goats, and oxen. The usual number possessed by an individual is two, but in the male chousingha or four-horned antelope of India two pairs are present; the front ones, which are frequently little more than knobs, arising above the creature's eyes; and the back ones, which attain to a length of about four or five inches, growing from the summit of the skull. The female is hornless.

The oryx antelopes are endowed with remarkably long and lance-like horns which may measure nearly four feet in length. They are common to both sexes, and are generally almost straight in alignment, although those of the sabre-horned oryx take a gentle backward curve throughout their length. Their basal halves are encircled with raised ridges, but the terminal halves are perfectly smooth and end in sharp points which render the appendages of such a formidable nature that their owners have been known to overcome a lion in combat.

Several species of antelopes, such as the eland and the koodoos, possess spirally-twisted horns; but in the latter their presence is confined to the males, whereas both sexes of the former carry them. Mention must be made of the sable antelope and the closely-allied roan antelope, the males and females of which are endowed with long recurved horns. When fighting, the animals kneel down upon the ground and attack their adversaries by taking sweeping blows at them with their piercing wea-

pons, a habit which is indulged in also by the gemsbok antelope.

The horns of the hartebeests are peculiar inasmuch as the extremities are turned backwards at a right angle to their general alignment; while those of the white-tailed gnus or wildebeests are equally curious, for in the adults they bend downwards and outwards from their bases and then turn abruptly upwards.

The prongbuck, although generally designated by the name 'antelope,' reveals several unique characters which entitle it to be classified as the sole representative of a separate family. Its upstanding horns, for instance, are much flattened at their sides, and resemble the antlers of a stag because of the tine-like protuberance which arises about midway along the front surface of each one. But a more extraordinary feature in connection with those appendages is that, unlike those of all other antelopes which are of a permanent nature, they are shed annually, the new ones commencing their growth under the sheaths of the old horns, and attaining to a length of several inches before the latter are discarded.

The giraffes are other animals which possess curious horns upon their heads. They are common to both sexes, commence their development and appear above the surface of the head before the creatures are born, and each one is composed of bone, covered with skin, which at first has no connection with the bones of the skull, although ultimately uniting thereto.

The horns or antlers of deer differ from those of any beast we have so far reviewed (with the exception of the giraffe), on account of their being solid throughout, and not receiving support from a bony core, although, as previously mentioned, they arise from a bony process or pedicel situated at their bases. All species of deer, with the exception of the musk-deer and the Chinese water-deer, possess horns; but their presence is confined to the bucks, except in the case of the reindeer, in which they are carried by both the males and the females. During their growth they are covered with a hairy skin which is extremely tender and feels quite warm to the touch because of its being very freely supplied with blood-vessels. They are then known as being in the 'velvet.' When their development is completed, a ring-shaped and bony deposit or 'burr' forms at the junction of each antler and its pedicel, thereby causing a constriction in that region and stopping the flow of blood to the investing skin of the antlers, with the result that the velvet dries up and is ultimately dispersed by the animal rubbing it against the trunk of a tree or some other suitable object. The antlers are then composed of what may be termed dead bone, inasmuch as they are quite insensitive. In due course an absorption takes place in the living bone situated beneath the burr, and the antlers eventually fall off, either by being knocked or by their own weight. Most deer shed them every year, but the sambur deer of India will often carry them for several seasons on end.

The shape of the horns varies considerably in

different species of deer. Sometimes they are merely short upstanding spikes; at other times they are palmated; while the more typical forms are of a branched nature, the branches, or tines as they are termed, increasing in number in successive years. Each tine bears a distinct name, and in the case of the red deer and others of a similar type, for example, that nearest the skull is called the 'brow-tine'; the next above, the 'bez-tine'; and the following one, the 'trez' or 'royal-tine.' The main branch from which the tines arise is designated the 'beam'; and this may divide at its summit into several tines known as 'surroyals,' or be broken up into numerous prominences or 'snags,' forming what is called a 'crown.' As each tine is more or less pointed at its extremity, one can realise that the antlers of deer are very efficient fighting weapons.

Quite a number of animals are endowed with a spiny armament. All the porcupines, for instance, are clothed in spines or 'quills,' the larger of which in the common or crested species may measure as much as sixteen inches. Under normal conditions they lie in repose along the animal's body, but when the creature is attacked it causes them to stand on end by contracting certain muscles of its skin, thereby displaying an array of penetrating weapons capable of inflicting serious wounds. The quills of the Canadian porcupine, although very inferior in length to those of the foregoing species, are, nevertheless, of a very formidable nature; for, being slightly barbed at their tips, and but loosely attached to the animal's skin, they remain firmly fixed into, and

work right through, the flesh of any victim which should happen to come in contact with them. The creature also makes use of its spiny-covered tail as an instrument of offence by swinging it in a sideways direction.

The hedgehog is another animal armed with a prickly coat, and its habit of rolling itself up into a ball renders it free from the attack of all but the boldest of enemies. Other mammals thus endowed are the tenrec, the echidnas or spiny ant-eaters, and the spiny-mice; the latter being represented by several species, one of them, known as the Malabar spiny-mouse, possessing a number of flattened and broad spines upon its back, while others, belonging to the genus *Acomys*, of which the Cairo spiny-mouse is a familiar example, are endowed with thick, stiff, and grooved spines that take the place of hair upon the hinder and upper portion of their backs. These growths, however, are not of a sufficiently formidable nature as to entitle them to be classified as offensive weapons, although, doubtless, they have a certain degree of protective value by rendering their owners somewhat indigestible items for other creatures to feed upon.

Amongst the lizards there are numerous kinds which are covered from head to tail with tough and spiny scales. As a rule the armament merely serves as a sort of protecting cuirass and is of no use for offensive purposes, but in the case of the mastigures or thorny-tails the spines are employed as weapons, the reptiles lashing their caudal appendages from side to side with a force that is suffi-

ciently powerful to lacerate the flesh of a human being. The crocodiles and alligators also make use of their armour-covered tails as a means of offence and defence, although, of course, their formidable array of teeth proves equally effective.

Certain species of fish possess spines upon their bodies, familiar examples being the sticklebacks, some of which have as many as fifteen upstanding and spinous growths upon their backs. Many of the skates and rays are endowed with a similar form of armament which is frequently situated upon their whip-like tails. The latter creatures are in the habit of lying almost concealed beneath the sand under the water, and, according to Mr. Day, some of them are stated to catch and overpower other fish that may happen to pass over their hiding-places by encircling the bodies of their victims with their caudal appendages, and then driving their sharp spines into the flesh of the unfortunate captives. The thornback skates (the term 'skate' being given to the long-snouted members of the ray family) are even better armed than the foregoing fish, for not only are their tails furnished with spines, but similar structures, which are broad at their bases and curve backwards at their extremities, arise at intervals upon the upper surface of their bodies, the growths, however, being more numerous in the females than in the males. Another member of the family, known as the common sting-ray, possesses a sharp and barbed spine projecting from the middle of its tail which may measure as much as seven

inches in length, is very loosely attached to the creature's body, and, when worn out, is shed and replaced by a new one. But the most remarkable species of all is the electric ray, which, as its name implies, is capable of transmitting an electric shock to any living creature coming into contact with it. This means of protection is not confined, however, to this fish, for others, namely the electric-eel and the electric cat-fish, are endowed with a similar power, concerning which we propose to deal at length in the following chapter.

A form of armament akin to the spines and quills possessed by the foregoing creatures are the spurs which are present upon the limbs of certain other animals. Amongst the mammals thus endowed are the platypus or duckbill, and the echidnas, the males of which are furnished with a sharp and horny spur arising from the heel of each foot, projecting upwards and backwards, and attaining to a length of about an inch.

There are quite a number of birds armed with spurs upon their legs or wings. In some instances the wing-spurs are shed every season and replaced by new ones, but the leg spurs are always of a permanent nature. The males of the jungle-fowl, and many of the pheasants are provided with leg-spurs of a very formidable nature; some of the latter, such as the blood-pheasant (*Ithagenes cruentus*), a species found in the Himalayas, possessing as many as four pairs. Both sexes of the pheasant-like spur-fowl (*Galloperdix*) of India are armed with similar weapons, the cock birds occasionally being provided with three

pairs, while the hens usually have a single pair, although sometimes that number is doubled.

Wing-spurs are present in many birds. The pheasant-tailed jacana or water-pheasant, the spur-winged goose of Africa, and some of the plovers possess a single spur on each of their wings ; while the South American crested screamers are unique in the fact that they are endowed with two pairs. The larger ones attain to a length of an inch and a half, are nearly straight, triangular in shape, and arise from the second joint of the wing, while the smaller ones are curved and broad, and project from the terminal joint of the wing. Although these appendages prove very efficient instruments of offence and defence, yet many birds which are without them will make use of their wings as fighting weapons, the swans and the pigeons being notable examples.

Even in certain species of frogs we find that the males possess a penetrating armature in the form of spines or spurs. Some of the South American piping-frogs, for instance, develop spinous growths during the breeding season, which arise from their fingers and breasts ; while in certain tree-frogs they project from the anterior surface of their arms. Mr. E. G. Boulenger tells us that : ' In the males of some frogs, such as *Rana holsti* and *Hyla maxima*, what at first sight appears to be an innocent rudiment of the thumb is in reality a very formidable weapon, for mounted upon the carpus is a long, sharply-pointed bone, which pierces the skin when pressure is made upon it, and when one of these

frogs is caught it invariably strives to insert the spurs into the hand that holds it.'

In addition to those creatures previously mentioned as employing their tails as weapons, there are others which indulge in a similar practice. The large lizards known as iguanas and monitors will lash out at their adversaries with their caudal appendages; while the whales are able to render a good account of themselves in a like manner. The thresher shark is also stated to utilise that member as a means of offence, as well as for the purpose of lashing the water in order to frighten and herd together the fish upon which it preys, so that it can the more conveniently feed upon them.

Several kinds of animals, such as the skunk, the zorilla, and the Malay badger rely upon their power to eject an evil-smelling fluid wherewith to repel their enemies. The secretion yielded by the former creature is of a very powerful nature, and the fumes which arise therefrom produce a condition of nausea, or even unconsciousness, if inhaled for any length of time. Should the liquid be ejected into the eye, it not only sets up a painful inflammation, but has been known to cause blindness. In spite of its objectionable odour, the secretion was employed in former days as a 'smelling-salt' for the cure of asthma; and it is related that a clergyman, suffering from that malady, was in the habit of taking a tightly-corked bottle full of the remedy into the pulpit when he was about to preach, and sniffing at it when the need arose. Unfortunately, however, on one occasion he inadvertently removed the cork,

with the result that the congregation had hastily to leave the church.

As the skunk is able to expel its odoriferous fluid for a distance of as much as sixteen feet, one may well imagine that other animals find it convenient to give the creature a wide berth. The Malay badger, or stink-badger as it is sometimes called, shares the evil reputation of the skunk; and the zorilla or Cape polecat is but a degree less objectionable.

The beaks of birds are very efficient weapons; those of the storks, vultures, eagles, hawks, and parrots being of a very formidable nature. Even those of quite small birds are not to be ignored, for the writer knew a Brazilian troupial (a species not as large as a thrush) which would fly and strike at the eyes of any stranger who entered its aviary; while the combative tits and robins have been known to pierce the skull of other small birds with their bills.

The ostrich, the emu, the rhea and the cassowary fight with their feet, the latter directing its blows forwards, and the others delivering theirs in a backwards and outwards direction. Darwin states that rheas 'have been known to attack a man on horseback, trying to kick and leap on him.'

The diurnal birds of prey, as well as the owls, employ their sharp talons as weapons, and during combat with one another an individual will frequently lie upon its back and in that position ward off the attack of its adversary. Equally effective weapons are the claws of crabs, crayfish, and lobsters.

Many creatures, such as the scorpion, jelly-fish, bees and wasps, to which further reference will be found in these pages, make use of their power to sting as a means of offence and defence; the llama repels the attack of an enemy by biting, spitting, and striking out with its fore-feet; the horned toad or ceratophrys blows out its body to an enormous size in order to frighten away its foes, as also does the puff adder, which accompanies the action with much hissing; while the kangaroo, besides employing its powerful legs for kicking at an adversary, has been known to grasp a dog between its fore-paws and then hold it under water until it was drowned.

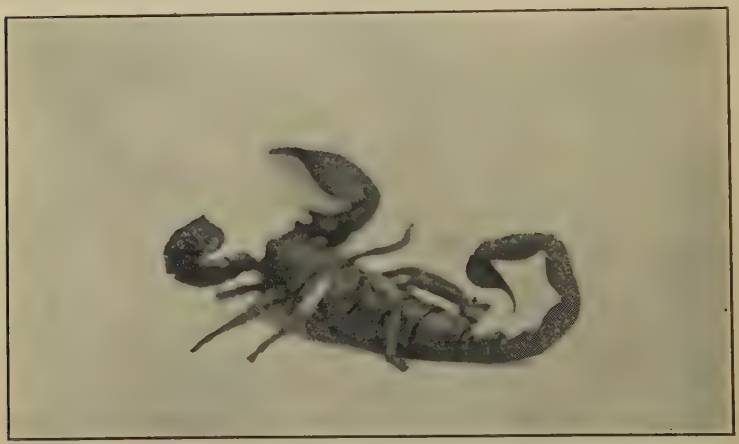
The armadillos are well provided with the means of defence, for their bodies, except upon the under surface, are encased in a horn-like covering which is arranged in numerous transverse bands. Even for offensive purposes the cuirass appears to be of service, for Mr. Hudson tells us that during a combat between one of these creatures and a poisonous snake, the former, after rushing upon its foe and pinning it to the ground, then commenced to lacerate the reptile's body by pressing upon it, and sawing backwards and forwards with the edge of its shell.

Few animals, if any, are better provided with the means of offence and defence than the octopus, or devil fish as it is sometimes called. As its name implies, the creature possesses eight tapering and mobile arms, each of which is furnished with a double row of suckers situated upon their inner

A WALRUS WITH FINELY DEVELOPED TUSKS. [*Page* 160.]

THE HORN OF A RHINOCEROS IS COMPOSED OF TIGHTLY PACKED HAIR FIBRES. [*Page* 164.]

THE CRESTED PORCUPINE POSSESSES AN ARMAMENT OF PENETRATING QUILLS. [*Page* 169.]



A SCORPION ELEVATING ITS STING. [*Page* 176.]

sides. With the aid of these the octopus seizes its prey, and fastens itself upon a victim with such a tenacious grasp that it is almost, if not quite, impossible to remove the arms without hacking them away. It then tears to pieces the flesh of the unfortunate captive with the aid of its powerful and parrot-like beak. In large specimens each grasping organ may measure as much as five feet in length, and possess as many as two hundred and fifty suckers. Notwithstanding its formidable nature, the creature has a host of foes, many fish, especially the conger eel, finding its flesh very palatable, as also do some of the whales.

When the animal is in danger, and in order to outwit its enemies, it resorts to the curious practice of expelling a dark-coloured fluid or 'ink' which is contained in a special pouch, thereby discolouring and rendering opaque the surrounding waters, and enabling it to escape unobserved to some hiding-place. This remarkable habit is also indulged in by the squids, the sepiola, and the sepia or cuttle-fish, the latter animal yielding the brown pigment called 'sepia' which is employed as a paint by artists. Cuttle-fish farms have been established in China for the purpose of breeding the creatures and collecting the secretion which they yield, the animals being kept in large tanks filled with sea-water. When it is required to obtain the 'sepia,' the inmates of the farm are driven one by one into separate metal-lined compartments, and the water is gradually drawn off so that the cephalopods are ultimately left high and dry,

when, becoming alarmed at the unusual situation, they show their displeasure by discharging their 'ink,' which is then easily collected.

Great care has to be taken to ensure that the cuttle-fish are not unduly disturbed when they are being introduced into their 'milking-stalls,' lest they should become annoyed or frightened, and disperse their fluid in the water.

Other creatures, in addition to those previously mentioned, have the power to eject a fluid secreted by their glands, making use of the same for defensive purposes. Darwin, in *The Voyage of the Beagle*, records having come across a sea-slug, about five inches long, that 'when disturbed emits a very fine purplish-red fluid, which stains the water for a space of a foot around.' The larva of the puss-moth, when irritated, also discharges some liquid from out of a cleft situated in its neck, the squirting apparatus being pierced by a number of holes like those in the 'rose' of a watering-can.

Before concluding our survey of animal weapons, mention must be made of the sword-fish and the saw-fish, both of which are armed with very formidable instruments of defence and offence. The former, which may measure as much as fifteen feet in length, is remarkable in the fact that its upper jaw is furnished with a long, wedge-shaped, and sword-like weapon, by means of which it transfixes the bodies of other fish that constitute its prey. It will also attack whales, and has even been known to charge at ships (probably mistaking the bottom of a vessel for one of the cetaceans),

an instance having been reported of an individual piercing through timbers to a depth of twenty-two inches. One species, namely the European or common sword-fish (*Xiphias gladius*), which attains to a length of ten feet, and possesses a 'sword' measuring about three and a half feet long, is occasionally found off the British coasts.

The saw-fish is also of large size, and has been known to measure as much as twenty-four feet in length. The upper jaw of the creature is prolonged into a long, flat, and beak-like structure, armed upon the edges with numerous sharp and pointed teeth which project sideways. With the aid of this weapon the fish strikes out at its prey and tears the flesh of its victim to pieces. The 'saws' may measure as much as five or six feet in length, and their formidable nature may well be judged by stating that several instances have been recorded of human beings, when bathing in the water, being cut in halves thereby.

CHAPTER XI

ANIMALS WHICH GIVE ELECTRIC SHOCKS

OF all the marvels of Nature, none is more remarkable than the power which enables certain members of the Animal Kingdom to give forth electric shocks. Although more than a century has elapsed since Lugi Galvani discovered the mysterious force called electricity, yet nobody can say from whence it originates. We know that it can be produced by means of machinery and also by chemicals, and zoologists have discovered the organs which the electric animals employ for producing and discharging their current; but beyond that everything remains a secret, and not even the greatest scientist can explain what electricity really is.

The electric eel (*Gymnotus electricus*) is one of the best known of what may well be termed 'the living batteries,' although, strictly speaking, it is not an eel but a near relative of the cat-fish. In general appearance, however, it resembles the former on account of its long, vermicular body

and smooth skin. Inhabiting the rivers and lakes of Brazil and the Guianas, and called by the Spanish settlers by the name of 'Tremblador,' the creature sometimes attains to a length of eight feet, and may have a girth equal to that of a man's thigh; while, moreover, its powers of discharging an electric shock are far greater than those of any other fish thus endowed. The electric organs are situated in the tail, and are composed of numerous cells containing a jelly-like substance.

The fish are very abundant in certain districts of their habitat, and the natives capture a large number of them for food by a method which, according to Mr. Holder, is called '*embarbascar con caballos*,' or 'intoxicating by means of horses.' Humboldt, who originally described the proceeding, states that mules and horses are driven into the water wherein the eels are lurking, whereupon the fish proceed to show their displeasure at being disturbed, and possibly trodden on, by discharging their electrical current into the bodies of the unfortunate quadrupeds. The latter are forced to remain in the water until the eels have temporarily exhausted their powers by continually delivering electric shocks, when the natives then leap upon the backs of their steeds and proceed to spear and land the fish whilst their means of offence and defence lies dormant. Occasionally, however, a man may happen to alight upon an individual which has not depleted its reserve of current, with the result that he receives a shock, conducted through the wet cord attached to the spear-head,

which may cause him to tumble headlong into the water. Although the electrical current transmitted by the larger eels is suffi iently powerful to kill those creatures which may happen to come into contact thereto, yet its strength depends a great deal upon the manner in which it is discharged, the shock being much more severe when the head and the tail of the fish are both brought into contact with different portions of a victim's body than if only one part be touched, and that by a single point of contact.

Professor Owen records some interesting experiments made upon one of these fish by Professor Faraday, and writes :—'That the most powerful shocks were received when one hand grasped the head and the other the tail of the gymnotus I had painful experience, especially at the wrists, the elbow, and across the back. But our distinguished experimenter showed us that the nearer the hands were together, within certain limits, the less powerful was the shock. He demonstrated by the galvanometer that the direction of the electric current was always from the anterior part of the animal to the posterior parts, and that the person touching the fish with both hands received only the discharge of the parts of the organs included between the points of contact. Needles were converted into magnets, iodine was obtained by polar decomposition of iodide of potassium, and, availing himself of this test, Professor Faraday showed that any given part of the organ is negative to other parts before it, and positive to such as

are behind it. Finally heat was evolved, and the electric spark obtained.'

The electric cat-fish, electric sheath-fish, or 'raad' (*Malapterus electricus*) of tropical Africa —the latter name, meaning 'thunder,' being the one by which it is called by the Arabs—although never attaining to a greater length than four feet, is, nevertheless, able to give a shock almost as powerful as that of an electric eel.

The electric organs, which are distributed over the entire body, and form a gelatinous coat, lie just beneath the skin; but it appears that the actual seat from which the current is discharged is situated upon the top of the fish's back, and indicated by a wavy and cream-coloured band. The 'battery' differs from that of any other electric fish, inasmuch as, instead of being composed of modified muscular tissue, it originates from the skin. Not long since a specimen of one of these curious fish was exhibited at the London Zoological Gardens, and notwithstanding that it was quite a small individual and only measured about four or five inches in length, yet, when the writer gently placed his fingers upon the creature's back, it caused a shock to pass through his hand and up the arm to nearly as high as the elbow.

According to the reports of missionaries who have spent many years in tropical Africa, the natives turn to account the electrical powers of these fish and make use of the same as a remedial agent when their children happen to be ill; the

'cure' being sometimes effected by placing a child in a bath full of water into which one or more of the fish are introduced; at other times by putting a fish into a shallow bowl of water so that the invalid can touch the creature and thus receive the electric current into his system; while another method adopted, somewhat suggestive of 'faith-healing,' is to make the patient drink some water in which the fish have been kept.

Of the several varieties of the electric rays or electric torpedoes, that known as the marbled electric-ray, cramp-fish, or numb-fish (*Torpedo marmorata*) is of special interest inasmuch as it is frequently to be met with off the British coasts, especially in the English Channel. Fully-grown specimens may measure as much as two feet six inches across, and attain to a length of over four feet, inclusive of the tail. The electric organs are large and oval masses situated on either side of the head, the upper surface of which is positive, while the lower surface is negative. The fish can give a shock sufficiently powerful to disable a man, but in order that the current may be transmitted to a victim it is necessary that a circuit be formed by making a contact with two different parts of its body.

An amusing story is related of an old Brighton fisherman who exhibited a live torpedo, and, proclaiming it to be the heaviest fish in the world, invited his audience to lift it out of the tank of water in which it was placed, a halfpenny being

charged for each attempt, and a shilling being offered as a prize to any one who could succeed in the task. Needless to say the owner of the fish obtained a good many coppers, but did not part with his silver.

The electric star-gazer and the common skate are other fish endowed with electric organs, those of the former being situated upon the top of the head and behind the eyes, while those of the latter are placed on either side of the creature's backbone. The skate, however, is only able to give a very feeble shock.

None of the mammals, birds, or reptiles has the power to discharge an electrical current from its body, but amongst the insects there are several species which are thus endowed. As far back as the year 1822, Mr. Yarrell, at a meeting of the Entomological Society, exhibited a large and hairy caterpillar which was discovered in South America by a naval officer who, on picking it up, received such a powerful shock that his right arm and side was paralysed for a considerable period. A communication was also made to the above-mentioned Society in reference to a species of the *Elateridæ* or click-beetles—those found in this country being known in their larval form as wire-worms—which was capable of transmitting a strong electrical shock and causing the arm of any one who touched the creature to become quite numbed for a few seconds; while General Davis records that, having picked up a specimen of a wheel-bug (*Reduvius*), found in the West Indies, he felt a shock which

travelled up his arm to as high as his elbow, the feet of the insect, through which he believed the electrical current to flow, leaving marks upon his flesh.

CHAPTER XII

ANIMAL LOCOMOTION

THE many and varied creatures which populate the earth show as great a diversity in their manner of progression as they do in their structure and habits. Some of them, for instance, are experts at swimming, others are endowed with the power to fly, others are proficient at leaping, while certain kinds can only get about by crawling along.

Although most animals move in a forward direction under normal conditions, yet some individuals progress backwards, while, moreover, in the worm-like and limbless lizard known as the amphisbæna we have an example of a creature that can get about equally well in either direction.

Reviewing first the mammals as being the highest class of animals, we find that the greater number of them possess four limbs of almost equal length. But in some species the hinder pair are developed to a much greater extent than the foremost pair; in others just the reverse is the case, while many of the aquatic and semi-aquatic types have their fore-limbs modified into paddle-like structures,

their hind limbs assuming the form of a rudder. The whales, the porpoises, the dolphins, the manatees, and the dugongs, however, are unique in the fact that they have no hind limbs.

Most mammals possessing four limbs apply both pairs to the ground when walking, but a few of them, such as the chimpanzee, the orang-utan, the gorilla, the gibbons, the bears, the jerboas, and the jumping-mice will sometimes assume an upright pose and walk upon their hind legs alone. As a rule, however, the above-mentioned apes walk upon all fours with the knuckles of their hands applied to the ground, while the hind feet may either be spread out flat or have the toes tucked underneath; but in captivity the chimpanzee will frequently make use of its fore-arms as crutches and swing its body forward and between them. The gait of the orang-utan is peculiar, and differs from that of the other anthropoid apes inasmuch as the creature turns the soles of its hind feet inwards, and walks upon their outer sides.

For sheer agility no monkey can vie with the gibbons, their slender bodies and enormous length of limbs at once proclaiming them to be expert acrobats. Notwithstanding that they can assume an upright pose and progress along the ground by walking entirely upon their hind legs, yet they rarely indulge in such a method of locomotion, as they are almost entirely arboreal in habits. When passing from tree to tree they make use of their hands as hooks, hanging on to a bough and swinging their bodies forward with their arms stretched

out to the fullest extent, and then leaving go of their support and taking a fresh hold when they reach another branch. During their progress the animals usually employ first the one hand and then the other in the manner of a gymnast practising on the hanging rings, but occasionally they will grasp a bough with both hands, and with a mighty effort hurl themselves forward through the air and alight upon another tree further away. Gibbons have been known to cover a distance of forty feet in a single flying leap.

The Canadian jumping-mice and the jerboas are also able to walk upon their hind legs, but when travelling fast they progress in a series of jumps. The former animal, which attains to a length of about three inches from the tip of its snout to the root of its tail, is reported to be more agile than any other rodent, and when progressing at full speed it can take a leap measuring as much as ten feet in length. It exhibits great ability in dodging and doubling when endeavouring to elude the pursuit of a foe.

The jerboas, all of which are characterised by the great development of their hind legs, are divided into several distinct groups, which differ the one from the other according to the number of toes upon the hind feet. One of the largest species is the Kirghiz jerboa, of Central Asia, which measures about seven inches in length, exclusive of its long tail, and is so fleet of foot that a man on horseback cannot overtake the creature in chase.

The kangaroos and the Cape jumping-hare are

other animals that can progress upon their hind legs alone. They do not walk in that manner, however, but hop along, the two hind legs being moved simultaneously and not alternately. When feeding they go on all fours. The larger species of kangaroos are able to cover a distance of almost thirty feet in a single leap ; and the jumping-hare or springhaas, an animal about the size of an ordinary hare, is able to take a jump of equal length when hard pressed. As a rule, however, the latter creature does not spring forward for a greater distance than nine feet in a single bound.

One usually regards the tail of an animal as a more or less ornamental appendage that is of little use to its owner except as a fly-whisk, but such is not always the case. A dog, for instance, when running, will utilise that member as an aid for turning rapidly ; and a cat, when walking along the top of a narrow object such as a garden fence, will employ its tail as a kind of balancing pole by switching it first to the one side and then to the other as occasion arises. Then, again, some creatures possess a prehensile tail which serves as a fifth limb, the capuchin monkeys, the spider monkeys, the howler monkeys, the woolly monkeys, some of the tree-porcupines, the tamandua and the two-toed ant-eaters, many of the opossums and phalangers, as well as the cuscuses all being thus endowed. Sometimes the extremity of that member is devoid of a hairy covering upon the under surface, thus rendering it far more sensitive as a grasping organ than would be the case if it were

fully furred. Most of the prehensile-tailed animals curl their caudal appendages in a downwards direction when holding on to an object, but, curiously enough, the Demerara tree-porcupine does just the opposite.

So highly prehensile is the tail of some creatures that they can actually suspend themselves from a branch by that member alone. Mr. Germain, describing the habits of one of the capuchin monkeys, writes :—' I have sometimes seen them at a height of about one hundred and fifty feet from the ground suspend themselves by the tail from a branch, then balance themselves, with all four limbs stretched out ; then, all of a sudden, let themselves go, and falling for a distance of some twenty or thirty feet, seize hold of another bough by the tail. In such falls the outstretched arms seem only ready in case of accident, for there is never any question of maladroitness.' Mr. Bates also gives a very interesting account of the agility of these monkeys, the writer stating that when a troop of capuchins are journeying in the forest and the leader ' reaches the outermost branch of an unusually high tree, he springs forth into the air without a moment's hesitation, and alights on the dome of yielding foliage belonging to the neighbouring tree, maybe fifty feet below, all the rest following his example.'

It is somewhat curious that not all mammals have the same number of digits on their hands and feet. The African colobus monkeys and the American spider monkeys have no thumbs, or else merely rudimentary stumps ; while other

creatures have five toes on the fore-feet and but four on the hind ones. With the ruminating animals such as the cattle and the deer, the number is reduced to two on each foot; and in the horse and its kindred only the middle one remains, which is enclosed in a solid sheath and forms a hoof.

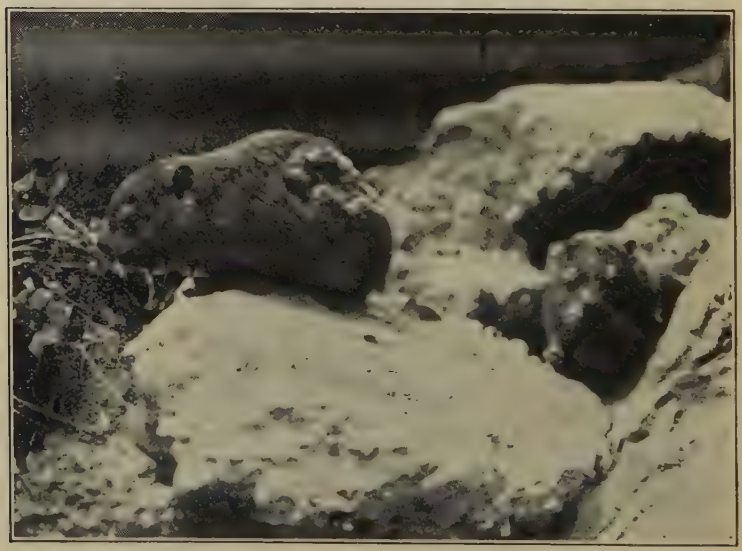
Then, again, amongst the carnivorous mammals we find that the various types differ in the manner in which they apply their feet to the ground: those which walk entirely upon their toes being called digitigrades, those which apply the sole of their feet to the ground being termed plantigrades, and those in which the limbs assume the form of flippers, as exemplified by the seals, the sea-lions, and the walrus, being known as pinnipeds. Although the two last-mentioned beasts can walk upon land, yet their movements when thus engaged are extremely ungainly and laboured; but when swimming in the water they progress with great facility and rapidity. The limbs of the walrus and sea-lions differ from those of the other pinnipeds; for whereas in the seals the hinder pair are permanently directed backwards, and the flapper-like fore-limbs are too short and immobile to be of any assistance in supporting the bodies of the creatures, with the result that, when moving on dry land, they can only wriggle along by moving their bodies in a series of jerky motions, yet the limbs of the sea-lions and walrus can be flexed to a considerable degree, the hind legs being turned forwards beneath the body and the fore-legs bent at the joint so that the lower portion of the limbs

THE HIND LIMBS OF A SEAL ARE PERMANENTLY DIRECTED BACKWARDS. [*Page* 192.]

THE HIND LIMBS OF A SEA-LION CAN BE TURNED INWARDS TO FORM FEET. [*Page* 192.]

THE SLOTH, THAT WALKS UPSIDE DOWN.

[*Page* 193.]



THE CAPE HYRAX, A CREATURE WITH SUCKERS ON ITS FEET. [*Page* 194.]

serves as a foot. The sea-lion is more agile than the walrus when on *terra firma*, and can travel fairly quickly by a curious and floppy kind of gallop, the hinder part of the body and the hind flippers being lifted clear from the ground and then thrown forward as it progresses.

Among the hoofed animals which claim special attention, the chevrotain or mouse-deer is curious because it walks upon the extreme tips of its toes and places its feet upon the ground with a very stiff action. In former days it was believed that the creature had no joints. Very different, however, is the gait of the springbok antelopes and the gnus or wildebeests, which exhibit a most graceful action—prancing, pirouetting and springing into the air when indulging in their gambols. Then, again, a very peculiar pose is assumed by the wart-hog, for when grubbing for food it will frequently walk with the so-called 'knees' of its fore-legs applied to the ground.

The great ant-eater when walking bends the toes of its fore-feet back; but the manner in which the sloth progresses is even more remarkable, for the creature walks in an upside-down position, holding on to the branches of the trees by means of the powerful and curved claws with which its fore- and hind-feet are armed. Occasionally, however, it will descend to the ground, but in such a situation it is only able to proceed with the greatest difficulty, dragging itself along by hooking on to the stones and tussocks of grass that may happen to be in its path. When thus engaged the animal supports

its weight upon the sides of its inturned feet, and applies the whole length of its fore-arms to the ground.

Some creatures are remarkable in the fact that they are provided with suckers upon their feet which enable them to progress in almost any position. Of the mammals thus endowed are to be numbered the tarsier and the hyraces. The former creature belongs to the monkey family, and is found in the Malay region. It attains to the size of a small squirrel, is nocturnal and arboreal in habits, and resembles a miniature kangaroo in the great development of its hind legs. The digits of its hands and feet terminate in round and flattened discs which serve as adhesive pads.

Of the several species of hyraces, that known as the dassie, klip-das, rock-badger, or Cape hyrax is probably the most familiar. Although greatly resembling a rabbit both in appearance and size, yet the animal is not a rodent but belongs to the Ungulates and claims close relationship with the rhinoceros. It is, however, the remarkable structure of its feet that we wish to draw special attention to, for not only are the naked soles provided with numerous glands that render the skin moist, but they are also furnished with certain muscles that can be contracted in such a manner as to convert the soles of the feet into suckers by means of which the creature is able to walk up the perpendicular face of a rock.

The tree-frogs and some of the lizards known as geckos also possess digital pads which enable them

to stick on to a smooth surface such as a sheet of glass. These pads owe their clinging power to strong muscular pressure combined with a sticky secretion which exudes from the skin. In some of the former creatures the under part of the body is also of an adhesive nature and clings tightly when pressed against the object upon which the animal is reposing.

Quite a large number of creatures possess the power to fly, and amongst the mammals thus gifted are the bats, the flying-squirrels, the flying-phalangers, and the cobego, although, strictly speaking, only the former are capable of true flight and of sustaining themselves in the air for any length of time. The remaining animals, however, can *glide* through the air for a short distance, supporting their weight by stretching taut the membrane-like flap of skin that lies along either side of the body, and is attached to the hind and fore limbs.

In a like manner some of the lizards are able to skim through the air ; while, moreover, certain frogs can also indulge in aerial excursions by means of their enormous webbed feet which offer a resisting surface to the atmosphere much in the manner of the planes of an aeroplane.

With the exception of the bats, which propel and lift their bodies by moving their large and membranous wings up and down, the motive power of the foregoing creatures is derived from the impetus gained when they hurl themselves into the air, and supplemented by the force of gravity as they glide towards the earth. As they can only progress in

a downward direction it is necessary for them to commence their 'flight' at a much higher elevation than that of the desired landing-place.

A few of the fish also have the power to leave the water and fly for brief periods by the agency of their enormously developed breast fins.

It remains with the birds, however, to claim the dominion of the air; although it must be mentioned that certain species pass their existence entirely upon *terra firma*. Some birds exhibit much greater skill on the wing than others. The herons, for instance, flap their wings, when flying, in a heavy and laboured manner, but the humming-birds and the kestrel are adepts in the art of hovering or hanging in the air in one spot. The kites and the buzzards are peculiar in the fact that they frequently sail through the air in circles with their wings stretched out and held motionless. The wagtails and the woodpeckers fly in a series of rising and falling curves, and the pigeons will often knock the tips of their wings together above their backs when thus engaged, thereby giving rise to a loud smacking noise. The dabchicks, the moor-hens, and the coots fly with their legs dangling beneath them, the flamingoes and the swans fly with their long necks held straight out in front of them, and the pelicans do just the opposite and rest their heads upon their backs. Then, again, the skylark ascends straight up into the air, and, when descending, will often drop like a stone for some distance and then sail gently to earth; while the tumbler-pigeon, as suggested by its name,

is in the habit of indulging in the most remarkable acrobatic performances when in mid-air, turning and tumbling over as if it were wounded.

The various kinds of birds differ considerably the one from the other in their rate of progress through the air. The Virginian plover is stated to be able to cover a distance of over two hundred miles in an hour; and the swift, one hundred and fifty to two hundred miles an hour. The partridge can fly at the rate of fifty miles an hour; and the blackbird and the finches at twenty-five or thirty miles an hour. The merlin covers a distance of seventy-five miles in a like time; the hobby and the peregrine falcon, one hundred and fifty to two hundred miles; the pheasant, forty-five to fifty miles; the golden eagle and the swallow, one hundred miles; and the sparrow-hawk, fifty miles an hour.

Birds vary also in their manner of locomotion when upon land. The majority of the smaller kinds hop, but the skylarks, wagtails, and starlings walk and run with alternate motions of their legs. The ducks and geese waddle, and the penguins stump along as if they were engaged in a sack race. The humble fowl bobs its head when it walks, but stretches its neck out straight and holds it stiffly when running; while the crested screamer looks just as if it were doing the German 'goose-step' as it progresses.

Few creatures are more wonderful than the fish in their manner of locomotion when in the water, most of them possessing an air bladder by means of

which they are able to alter their degree of buoyancy so that they can float or swim at any desired elevation. Some species, however, such as the flat-fish, the sharks, and the lampreys do not possess that organ.

The majority of people are under the impression that a fish propels itself through the water by the use of its fins, but, with few exceptions, such is not the case. The tail—that is to say, the posterior portion of the creature's anatomy, and not its *tail-fin*—is the member employed for propulsion, the fins playing only a secondary part and serving as balancing and steering organs. Of those fish which rely entirely upon their fins for the purpose of progression, two species, namely the pipe-fish and the sea-horse, are to be found in British waters. Both swim by rapidly vibrating their dorsal or back fins, and when so doing usually hold their bodies in a vertical or slightly inclined plane, instead of, as in the case of most fish, in a horizontal position. The sea-horse is further peculiar in the fact that it possesses a prehensile tail.

The needle-fish and the globe-fish are even more remarkable than the foregoing in the position they assume when swimming, the former standing upon its head when thus engaged, while the latter will often float belly uppermost. Under normal conditions, however, the globe-fish progresses in the usual fish-like manner, but when in danger from the attack of an enemy it inflates itself with air and distends the skin of its abdomen to such an extent as to cause itself to turn over and float with its

back downwards. As the body of the creature is studded with numerous spines, the stretching taut of the skin causes the prickly armament to stand on end, with the result that an adversary finds it more convenient to proceed elsewhere in search of its dinner.

The gurnards are curious fish inasmuch as they possess three finger-like processes situated in front of each of their breast fins by means of which they are able to walk upon the bed of the ocean; while the salmon, during the spawning season, indulge in the curious habit of leaping out of the water (frequently to a height of eight or ten feet) for the purpose of making their way up rapids or over cascades. In those rivers where the natural obstacles are too difficult to allow the fish to jump over by their own unaided efforts, wooden stairways or ladders are provided for their use so that they can ascend by degrees.

Jumping as a means of locomotion is favoured by many other creatures in addition to those we have previously mentioned. The cricket, the click-beetle or skip-jack, the flea and the sand-hopper, for instance, are all experts in that manner of procedure, the latter being capable of leaping twelve times as high as the length of its own body. Then, again, most of us are familiar with the jumping-bean, wherein dwells a maggot which has the mysterious power to lift itself and its domicile clear from the ground by alternately contorting and relaxing its body.

The writer has seen it reported in all seriousness

that the hoop-snake progresses along the ground by seizing its tail in its mouth and then bowling along in the manner of a hoop being trundled. Although it is hardly necessary to say that there is no truth in the statement, yet a certain parasite of the bat does proceed by rolling over and over, Tennent recording that the creature moves ' by rolling itself rapidly along, rotating like a wheel on the extremities of its spokes, or like the clown in a pantomime hurling himself forward on hands and feet alternately. . . . Its speed exceeds that of any known insect, and as its joints are so flexible as to yield in every direction . . . its motions are exceedingly grotesque as it tumbles through the fur of the bat.'

Turning our attention to those creatures which are only able to crawl, we find that the snakes and the legless lizards walk as it were upon the extremities of their ribs, assisted by the projecting edges of the scales upon the under surface of their bodies, which offer a resistance to any rough surface that they may happen to come into contact with. Should, however, one of the reptiles be placed upon a sheet of glass, it is perfectly helpless. When crawling along, snakes invariably move their bodies in lateral wave-like motions, and never in vertical undulations, as one frequently sees depicted in illustrated books.

The common earthworm indulges in yet another form of locomotion, for by alternately contracting and expanding the segments of its body the creature forces itself along, aided by the numerous minute hairs which project from the skin.

Caterpillars resemble earthworms on account of their bodies being divided into numerous segments or movable rings, but they differ in the fact that they also possess a number of legs, as many as sixteen sometimes being present. The majority of them creep along with an undulating and crawling motion, but the loopers, geometers, or span-worms as they are called in America, are unable to crawl because the middle portion of their bodies is unprovided with legs. When walking they progress in a series of looping strides, grasping firmly with their single pair of hind legs or prolegs, as well as with their two claspers, as the terminal pair of leg-like members are termed; then stretching out their bodies and talking hold with their three pairs of forelegs or true legs, after which they proceed to unclasp their hind legs and, arching their bodies, place them close to the front ones.

The octopus, the cuttle-fish or sepia, the squid, the nautilus, and the argonaut progress in a very curious manner, for when swimming they propel themselves backwards by means of expelling water through a funnel-like organ known as a siphuncle, a performance that may be likened unto a rocket being lifted upwards and backwards into the air by the force of the discharge of the chemical compounds contained within its outer wrapper. The creatures employ their arms or tentacles, however, for the purpose of walking and climbing, and when progressing along the bed of the ocean they proceed head downwards.

In former days it was believed that the argo-

naut was in the habit of journeying over the surface of the water by making use of its shell as a boat, and then holding two of its arms in the air to act as sails while it rowed along with the remaining six. James Montgomery wrote the following poem on the supposed powers of the creature :—

Light as a flake of foam upon the wind,
Keel upward from the deep emerged a shell
Shaped like the moon ere half her horn is fill'd ;
Fraught with young life, it righted as it rose,
And moved at will along the yielding water.
The native pilot of this little bark
Put out a tier of oars on either side,
Spread to the wafting breeze a twofold sail,
And mounted up and glided down the billow
In happy freedom, pleased to feel the air,
And wander in the luxury of light.

The snails, whelks, and limpets walk along by contracting and expanding their 'foot,' as that portion of their anatomy upon which they crawl is termed. The limpets rarely go far from their head-quarters, and even when they do take a walk abroad they invariably return to the exact spot from whence they started, fixing themselves thereon with a grip of such tenacity that, according to Mr. Edgar Smith, it requires a force of sixty-two pounds, or one thousand nine hundred and eighty-four times the weight of an average-sized specimen, to dislodge it.

The cockle progresses in a curious manner, for with the aid of its long and bent foot it gives a vigorous kick upon the ground, and thereby forces

itself up into the air for a distance of a yard or more. The lobster also indulges in a peculiar form of locomotion. When alarmed it spreads out its tail and curls it up beneath its body with such rapidity as to force itself backwards through the water.

The majority of crabs are only able to move along the ground with that curious sideways gait that is so familiar to every one, but the members of the genus *Portunus*, of which the velvet crab is a well-known species found around our coasts, are capable of swimming through the water by means of their hind legs, which terminate in flattened and oar-like growths. Then, again, the five-fingered star-fish is provided with numerous tentacles or tube-feet upon the under surface of its rays, by the use of which it can crawl slowly along the ground, covering a distance of two inches during the course of a minute. The jelly-fish, although very helpless and unable to control the direction of their course through the water, are, nevertheless, able to make some progress by alternately expanding and contracting their bell-like bodies.

CHAPTER XIII

POISONOUS ANIMALS

NATURE has bestowed upon animals various means of defence and offence, but by far the most remarkable is the power that some of them have to secrete a poison by means of which they can repel, wound, and even kill other living creatures. The poison of certain species is very deadly in its action, while that of others is less dangerous and only gives rise to unpleasant symptoms ; but in all cases the virulence thereof depends to a great extent upon the health and vitality of those which secrete it.

By far the most dangerous of venomous creatures are to be found amongst the snakes, but certain lizards, spiders, centipedes, scorpions, frogs, fish, wasps, bees, ants, jelly-fish, and caterpillars are endowed also with the power to emit a poisonous fluid from their glands. Even amongst the mammals we have examples in the duckbill, platypus or ornithorynchus, and the echidnas, which are capable of inflicting a poisonous wound through the agency of horn-like spurs projecting from the creatures' heels in an upwards and backwards direction for a distance of about an inch.

The venom of snakes is secreted by glands which are situated behind and below the reptile's eyes, and in some cases extend back for a considerable distance along the sides of their bodies. To these glands are attached a number of muscles which, when contracted, force the fluid into the base of the poison-fangs from whence it is conducted into grooves or channels which open at the summit of those teeth. The muscles are only brought into play when the snakes are in the act of 'striking' with their mouths wide open—a provision of Nature which ensures against the venom being wasted to no purpose—and although the majority of them only discharge their poison when actually biting, yet a few species, known as spitting-snakes, have the power to eject the same by spitting it out. It is frequently the case that a snake breaks its poison fangs through too vigorous use, but the creature is well prepared for such a mishap, and other ones, in varying stages of development, are always ready to take their place. These naturally take some little time to attain to their full size, but as a snake is unable to eject venom unceasingly on account of the available quantity being reduced after each successive bite, an enforced rest enables it to store up a fresh supply for future needs.

In the majority of snakes, their poison is a translucent fluid of a pale yellow tint, and although usually tasteless, that of the cobra is stated to have a very bitter flavour. As some of my readers may wonder how anyone could taste the poison of a

snake and yet live to describe his sensations concerning the same, it may be as well to explain that the fluid is inoperative unless it enters the blood of a victim, and, therefore, provided a person is perfectly healthy, he can take a few drops diluted with water without fear of any bad effects. Should there be any abrasion of the digestive organs, however, the venom is then absorbed into the system at the seat of the weakness and proves just as dangerous as if it had entered the blood by means of a direct bite. Snake poison is extremely powerful in its action, and retains its deadly properties for a great length of time, even in a dried state; some thus preserved for twenty years having been proved to have lost none of its potency.

The only venomous snake found in the British Isles is the viper or adder. It rarely exceeds twenty-five inches in length, although on the Continent larger specimens are occasionally to be met with. It is characterised by having a dark-coloured zig-zag design upon the upper surface of its body which usually ends in a V-shaped mark on the top of its head, but, unfortunately, the markings are very indistinct in some individuals, although, on the other hand, the writer has seen a specimen in which the pattern was almost jet-black, and the body-colour nearly white. In spite of the poisonous nature of the viper's bite, it rarely causes death in man, for unless a victim is in poor health at the time of inoculation, there is usually every hope of his recovering from the effects of the venom. An interesting account of the symptoms attending a bite from

one of these reptiles was recorded by Mr. W. A. Rudge, of Plymouth, in a contribution to *Nature*, from which I take the following extract :—' While examining a viper it struck me on the right thumb. I immediately sucked the puncture, which bled a little, and tried to make light of the matter. A livid patch soon formed round the point, and the hand and arm began to swell. In a quarter of an hour I was unable to hold anything and almost in a fainting condition. The symptoms I experienced were a peculiar taste and a sensation of swelling in the teeth ; then the tongue commenced to swell, and became so large that I could hardly move it ; my eyes seemed ready to start from their sockets. In half an hour a terrible vomiting commenced, preceded by severe pain in the stomach and heart ; this continued for nine hours . . . My arm was practically without pain and I did not lose consciousness at any time. The arm continued to swell for two days, and finally was almost as large as my leg. After then the swelling subsided, but my arm did not regain its normal size for twelve days. Afterwards I suffered much from rheumatic pains and impaired digestion.'

Domestic cattle not infrequently suffer from the bite of vipers, and in some cases even succumb under the virulence of their venom. An instance is recorded of a cow having been bitten which soon became in a comatose state and much swollen about the head, both its eyes being quite invisible, and its breathing being accomplished with great difficulty. The animal ultimately recovered, but was

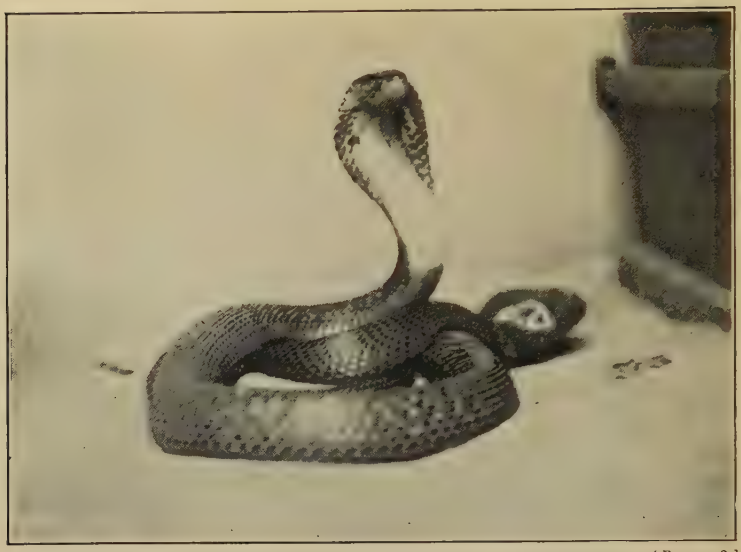
never again of value owing to the fact that it had lost its power to yield milk.

Many people are under the impression that most snakes are poisonous, but this belief is not established by fact; and in reference to this point Mr. E. G. Boulenger writes :—' Although the idea is prevalent that the majority of snakes are venomous, the reverse is in reality the case, for of the couple of thousand or so different species, barely one-third are endowed with poison glands, and of these the bite of not more than one hundred and fifty would produce death in man.' Unfortunately, there is no sure means of distinguishing at a glance a venomous from a non-venomous snake unless an inspection be made of its teeth; and as few of us would care to make such an examination to satisfy our curiosity regarding that point, it is just as well to keep at a respectful distance from all of them, except those with which we are familiar and know from experience to be harmless.

One of the deadliest of snakes is the cobra. There are ten different species to be found in Africa and the warmer parts of Asia, all of which can readily be recognised by the manner in which they raise their heads and expand the skin-folds of their necks into the form of a hood when annoyed. Probably no snake is responsible for causing more deaths in India than the ' cobra de capello ' (meaning ' hooded snake '), a reptile which is largely nocturnal in habits, and very fond of concealing itself during the daytime amidst stacks of wood, under the shelter of walls, and in old buildings. The typical race is

THE GURNARD—A FISH THAT CAN WALK. [*Page* 199.]

THE VIPER OR ADDER—THE ONLY BRITISH POISONOUS SNAKE. [*Page* 206.]



INDIAN COBRA—ONE OF THE DEADLIEST SPECIES OF SNAKES. [*Page* 208.]

THE PUFF-ADDER—ITS VENOM IS USED FOR POISONING ARROW-TIPS. [*Page* 215.]

decorated upon the back of its neck with a light-coloured design which resembles an inverted pair of spectacles; but others are marked with an ocellus or ring-like design; and in some individuals no pattern is present. In Bengal, those with the spectacle mark are termed *Gokurrahs*, and those with the ocellus are called *Keautiahs*. As a general rule the cobra de capello is not of an aggressive disposition, and, unless disturbed, will seldom attack a human being; but, nevertheless, owing to the creature principally confining its activities to the night-time, the danger attending the meeting of one is much greater than would otherwise be the case were it diurnal in habits. Should a man be bitten by a cobra, the symptom first produced by the action of the venom is a burning sensation in the region of the wound, which is followed by considerable swelling and tenderness. After an interval of about half an hour, the victim begins to feel sleepy and his legs become so weak that he is quite unable to stand. Paralysis of the tongue and larynx supervenes, and then a more or less general state of paralysis which is liable to affect the respiratory organs and the heart to such an extent as to prove fatal. If, however, the patient is able to throw off the latter symptoms, he rapidly recovers his normal state of health.

Many remedies for the bites of poisonous snakes have been tried with varying degrees of success, and ammonia is stated to be a most useful agent, Professor Halford recording that of twenty cases in which hypodermic injections of that fluid were

had passed the night. Although the banded-krait rarely makes use of its power to inflict a poisonous bite, except for the purpose of overpowering its prey, yet its smaller relative, known as the blue-krait, is responsible for a very large number of deaths amongst human beings. An instance is recorded of a soldier who was bitten by one of these reptiles dying after an interval of eight hours.

Of the smaller kinds of venomous snakes, the carpet viper, and the cerastes or horned viper are justly dreaded, for, in spite of their diminutive size, their bite usually proves fatal. The former species, which does not exceed two feet in length, inhabits the desert regions of North Africa, South-West Asia, and India. A short time back a man was bitten on the forehead by a captive specimen, but notwithstanding that he was promptly removed to hospital and received treatment within a quarter of an hour after the accident, yet, on arrival, his temples (upon which only two small punctures were visible), and his face were much swollen, and in spite of the best attention his death ensued after an interval of twenty-five hours. The second species referred to, which receives its name on account of the two horn-like projections that sprout from its head, is found in the desert regions of North Africa. Its pale, sandy-yellow colour harmonises so completely with its surroundings as to render it almost invisible, even when an observer is but a few feet away. According to reports, the reptile is capable of causing the death of a man within half an hour of inflicting a bite, yet, notwithstanding, the natives

appear to have no fear of the snake, neither do they hesitate to pick one up. Tennent states that their power of resisting the effects of a bite is due to 'the use of a plant with the juice of which they anoint themselves before touching the reptile,' while Bruce tells us that the people of Sennar chew a certain root, and prepare an infusion of various plants with which to wash themselves for the purpose of rendering themselves immune against the action of the venom.

The rhinoceros or nose-horned viper, so called because of the fleshy prominences which grow upon its snout, is another poisonous snake found in East and West Africa. It grows to a length of five feet, and its sluggish nature may well be judged by quoting from the writings of Mr. Cuthbert Christy, who reports having observed a hundred men, who were walking in single file, pass within twelve inches of one of the reptiles without it taking the slightest notice of their presence. He further points out that these snakes are in the habit of concealing themselves under the shelter of a small plant which bears upon its branches a number of burrs, and comes to the conclusion that this situation is specially chosen by the reptiles for the purpose of catching any small birds which may alight upon the twigs and become entangled and hampered by the burrs sticking to their feathers, in which case they fall an easy prey to the watchful snake and save it the trouble of unduly exerting itself for the capture of its prey.

Russell's viper, a native of India, Ceylon, Siam

and Burma, is, next to the cobra, considered to be the most dangerous snake found in those parts, and, according to Sir J. Fayrer, if a chicken be bitten by one of them it will expire in less than a minute. The reptile grows to a length of four feet, and the general brown colour of its skin is beautifully decorated with a series of dark-coloured rings, from which feature it also receives the name of chain-viper.

Amongst the venomous snakes found in America, the dreaded rattlesnakes are characterised by the possession of a horny structure which grows upon the end of their tails, and is composed of numerous and loosely connected ring-like segments. When one of the reptiles is irritated or disturbed, it rapidly vibrates that appendage and produces a peculiar rattling sound, concerning the utility of which no definite conclusion has been arrived at; for although some authorities consider it to act as a signal and a warning to other creatures to keep out of its way, yet others, on the contrary, have gone so far as to express a belief that the noise is produced in order to attract the attention of the snake's prey and arouse their curiosity to such an extent as to induce them to approach near enough to enable the 'rattler' to make a lunge and inflict a bite. It must be stated, however, that the latter theory, although having received a certain amount of credence in former days, is no longer regarded as a satisfactory explanation by the majority of naturalists. At one time the poison of the rattlesnake was considered to be a cure for leprosy, but we read in Mure's *Pathogenesie Brésillienne* that an experi-

ment was made some time back upon an unfortunate sufferer from that malady in order to test its efficacy, with the result that the patient died. The virulence of the reptile's venom may well be judged by stating that, when in a dried state, it has been proved to lose none of its potency after having been frozen for half an hour at a temperature of four degrees above zero, or heated to as high as 210 degrees Fahrenheit.

Mention must be made of the African puff-adder, which is remarkable for its habit of distending its body with air when annoyed or irritated. The Hottentots kill the creatures by spitting tobacco-juice into their mouths, while, according to Mr. Lydekker, the Bushmen use the reptiles' venom for the purpose of poisoning the tips of their arrows, the juice of the amaryllis being incorporated with the fluid so as to make it adhesive.

The poison of snakes is frequently used in medical practice, both in European and foreign countries. We read that the Kabirájes, or 'fathers of medicine,' of Bengal, obtained their supply of cobra venom by placing one of the snakes within a covered earthen pot containing several green plantains. This was then placed over a fire until the inmate became annoyed and showed its displeasure at being toasted by biting upon the inoffensive plantains. The fruit was then removed, and those parts which had turned black through the action of the injected venom were cut out, dried, powdered, and purified in various ways, when the preparation was ready for use as a medicine, the application of which was resorted to

in order to accelerate the action of a patient's heart, and also as a remedial agent for the treatment of cholera.

Passing to the lizards, we find that of the numerous different kinds which populate the earth only one genus, represented by two species, is capable of inflicting a poisonous bite. Found in Mexico and Arizona, and known as gila monsters or heloderms, they are remarkable for their conspicuous salmon and black, or yellow and black colouring, and for the granular nature of their skin, which looks as if it were composed of numerous small beads arranged in juxtaposition to one another. The creatures attain to a length of two feet, and possess very thick tails which serve as a storehouse for the accumulation of fat upon which they can subsist when food is scarce by absorbing it into their systems. As many as fifty poison fangs may be present in the mouth of one of these reptiles, each of which is furnished with a grooved channel for the passage of the venom. Several instances have been recorded of human beings being bitten by these creatures with fatal results, but as a rule they are of a very placid disposition, and those which the writer has known in a captive state did not resent being handled.

Although in no way comparable to the poison of the foregoing creatures, yet all batrachians secrete a venomous fluid which they emit from their person as a means of self-protection. In the case of the toads, the poison is contained in glands which are usually very numerous and take the form of wart-

like protuberances upon their bodies, while large swollen masses are frequently present upon the sides of their heads behind their eyes.

The common toad is well endowed with poison glands which yield a bitter fluid that is so virulent in its action as to cause a dog to foam at the mouth should it be so indiscreet as to attempt to pick the creature up. Mr. Buckland records the case of a man who bit off the head of one of these creatures for a wager, with the result that his lips, tongue, and throat quickly became very swollen, and rendered him dangerously ill for a considerable time.

The ornamented, horned, or burrowing toad of the Argentine and Southern Brazil also possesses a very powerful poison, and Mr. W. H. Hudson writes in his book *The Naturalist in La Plata* concerning the species :—' One summer two horses were found dead on the plain near my home. One, while lying down, had been seized by a fold in the skin near the belly ; the other had been grasped by the nose while cropping grass. In both instances the vicious toad was found dead, with jaws tightly closed, still hanging to the dead horse.' The creatures are of a very savage disposition, and if once they obtain a firm grip with their teeth upon a victim, it is almost impossible to make them leave go without killing them. They have a curious habit, when annoyed, of puffing out their bodies to such an extent as to make them appear as if they were about to burst.

It is a common belief amongst the natives of South America that the milky fluid secreted by the glands of toads possesses curative power, and,

according to the previously quoted authority, 'it is their invariable specific for shingles . . . and to cure it living toads are applied to the inflamed part.'

The secretion from the skin of the variable tree-frog (*Dendrobates tinctorius*), a creature which grows to a length of about one and a half inches, and is found throughout tropical America, is utilised by the Indians for the purpose of poisoning the tips of their arrows, a single individual yielding sufficient venom to place upon as many as fifty arrows.

Passing to the fish which possess venomous powers we will take as our first example the familiar weaver-fish or sting-bulls that are found off the coast of the British Isles. They secrete a slimy fluid upon their spines which is so powerful in its action that if a person be stung in the hand by one of the creatures the resulting pain can be felt right up the arm to as high as the shoulder after an interval of but a few minutes. A very graphic description of the effects arising from a sting from a weaver-fish was contributed some years back to the pages of the *Country Side* by Mr. M. B. Norgate, the correspondent writing:—'Last year when bathing at Paignton I had the misfortune to step on one of the stinging-fish. It was a very low tide, and we were out a great distance from dry sand. I thought I had stepped on a piece of sharp glass, and yet could only see two small punctures on the sole of my foot, as though caused by a prick from a two-pronged fork. I found the pain so intense whilst I dressed that I could hardly forbear from screaming out;

and from my foot to the tips of my fingers I had a purple mark about two and a half inches wide running up the side I was stung. The agonies of pain seemed to make an intense acid taste in my mouth, and I trembled all over. I had to sit down and hold my foot, hoping to ease the terrible pain. My friend sent for some carbolic oil, and dressed my foot, but it did little or no good. Never shall I forget the dreadful pain as I had to limp home. My foot did not entirely recover from the tenderness for several weeks.'

The sting-rays, of which one species is to be met with off the southern coast of England, are other fish that are able to inflict a poisonous wound through the agency of a slime-covered and barbed spine situated upon their tails, and sometimes growing to a length of seven inches; while in the coastal waters of Central America are to be found some small ground fish, known scientifically as *Thalassophryne*, that are endowed with four spines (one arising on each gill cover, and two upon the back), at the base of which lie small sacs containing a poisonous fluid. The spines are modelled upon the same principle as the poison fangs of a snake, each one being pierced by a tubular channel that conveys the venom from the poison bags into the flesh of any victim which should be unfortunate enough to come into contact with them.

Some of the remarkable creatures known as sea-slugs possess stinging cells situated upon the club-like growths arising from their backs; and the cone-shells which are found principally in the equatorial

seas, and obtain their food by patiently boring through the shells of other molluscs and feeding upon their flesh and juices, have numerous poison glands opening out of each of the barbed teeth with which their rasping organs are armed.

As many of us know from experience, jelly-fish are able to sting and give rise to a sensation which may be likened unto the stinging of a nettle ; while the anemones, especially those which are brightly coloured, possess a number of stinging cells, as also do the coral polyps. Darwin writes in reference to the latter :—' The stinging property seems to vary in different specimens : when a piece was pressed or rubbed on the tender skin of the face or arm, a pricking sensation was usually caused, which came on after an interval of a second, and lasted only for a few minutes. One day, however, by merely touching my face with one of the branches, pain was instantaneously caused ; it increased as usual after a few seconds, and remaining sharp for some minutes was preceptible for half an hour afterwards. The sensation was as bad as that from a nettle. . . . Little red spots were produced on the tender skin of the arm, which appeared as if they would have formed watery pustules, but did not.'

The spiders are other creatures which secrete a poisonous fluid, and although in the majority of cases their venom is not sufficiently powerful to prove injurious to mankind, yet notable exceptions are to be found in the enormous bird-eating spiders, some of which are able to span an object as large as an average-sized saucer with their outstretched

legs. Notwithstanding that popular opinion has credited the bird-eating spiders with subsisting entirely, or for the greater part, upon birds, yet this belief is quite erroneous, for the bulk of their food consists of various insects. Nevertheless, it is a fact that they do occasionally catch and eat small birds, and several instances have been recorded of such prey being seen in their clutches; while, moreover, those kept in captivity have been known to kill mice, small lizards, and frogs. They do not snare their prey in webs, but rely upon their agility to run and pounce upon any unsuspecting victim which happens to pass near to their hiding-places, and, when once within their grasp, give it a nip with their powerful fangs, and inject a dose of venom into its body. Even the hairs which cover the body and legs of these spiders are capable of piercing the flesh of those who come in contact with them, and, in the case of a human being handling one, to set up an irritation which is almost unbearable. Then, again, the tarantula spiders are held in great dread by the peasants of Southern Europe, who believe that their bite causes a malady akin to epilepsy. From an old account, given by Hermann Grübe, we are told:—'Those who are stung by the tarantula are, some of them, seized with laughter, others with weeping, others with continued wakefulness, others with stupor, others with nausea and vomiting. . . . Music causes victims to dance and perspire so freely that the poison leaves the system.' Needless to say, the above statement is a vivid stretch of imagination,

although, doubtless, a bite from one of these creatures would produce very unpleasant results.

A genus of spiders known as *Latrodectus* are greatly feared on account of their poisonous bite, and one kind, namely, the katipo (*L. scelio*), of New Zealand, is so venomous that, according to the writings of Dr. Calmette :—' The Maoris are so much afraid of the bite of the katipo that, when one of them has been bitten in his hut, and the animal cannot be found, they do not hesitate to burn the dwelling to the ground. Moreover, they are convinced that the death of the spider is absolutely necessary for the recovery of the patient.'

The centipedes are all endowed with a poison gland which is situated in the terminal fang-like segment of their jaws, the latter being pierced by a small channel through which the venom flows. The distribution of these creatures is almost universal, but those found in the tropics are giants of their kind and frequently attain to a length of eighteen inches, one of the largest being *Scalopendra gigantea*, of Trinidad, which, besides being able to inflict a poisonous bite with its powerful jaws, can also exude venom from its feet.

Although millipedes are commonly regarded as being poisonous animals, yet such is not the case. Nevertheless, they possess numerous stink-glands which secrete an evil-smelling fluid containing prussic acid, which is emitted through pores upon the sides of their bodies.

In the scorpions we have a group of creatures which are able to inflict a very poisonous wound

in the flesh of a victim through the agency of a sting or piercing weapon projecting from the terminal and bulbous section of their tails, wherein lie two glands which secrete a poisonous fluid that is capable of paralysing or even killing small mammals, but is not sufficiently powerful to cause death in a normally healthy man. They are found in most of the warmer regions of the world, and although those which inhabit Southern Europe do not attain to any great size, yet in tropical Africa and Southern India they frequently measure as much as nine inches in length. As a rule they are nocturnal in habits, and during the daytime lie concealed under stones, beneath sand, or within the shelter of holes which they excavate in the soil with the aid of their powerful pincer-like claws. They feed upon insects, various kinds of larvæ and spiders. Notwithstanding that the creatures possess a number of eyes, it appears that their vision is so defective that they are unable to see anything directly in front of themselves, with the result that they are forced to wait for their prey to come within the reach of their grasp, instead of going forth to hunt for it. When once, however, a victim approaches near enough to one of these creatures, it quickly seizes its prey and proceeds to plunge its sting into the flesh of the unfortunate captive by elevating and curling its tail forwards and downwards over its own back. Never do scorpions thrust out backwards with their stings when attacking other animals. They are generally of a very unsociable disposition, and if two of them

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should happen to meet during their wanderings abroad, a battle to the death usually ensues, and the victor of the fray celebrates his victory by making a meal of his victim. Even their matrimonial affairs are not conducive to a lasting affection between the two sexes, for although during the courting period they behave in the most approved fashion, yet when once they are married all feelings of sentiment gradually cease until one day the remains of the poor husband, who has the misfortune to be considerably smaller than his better half, may be found reposing within the home which, but a short time previously, had sheltered the bride and bridegroom.

Further examples of stinging creatures are to be found amongst the bees, wasps, and ants, and many of us are, doubtless, familiar with the pain produced by the venom which the former are able to inject into our skin through the agency of their piercing organs or ovipositors. Mr. Ainsworth Davis, in his book *The Natural History of Animals*, gives a very interesting description of the construction of a bee's sting, as follows :—' The hard part . . . consists of three rods, of which one acts as a " director," along which the other two can be moved backwards and forwards, each of them presenting a longitudinal groove which works along a corresponding ridge. Each of these two " piercers " is a kind of flattened stylet, the tip of which is studded with a number of minute barbs. There are two poison glands secreting respectively an acid and an alkaline secretion,

THE HELODERM—THE ONLY POISONOUS LIZARD. [*Page* 216.]

THE TARANTULA—A POISONOUS SPIDER FROM SOUTHERN EUROPE. [*Page* 221.]

THE POP-EYED GOLDFISH, WITH ENORMOUS PROTRUDING EYES. [*Page* 234.]

THE VEIL-TAILED GOLDFISH—A BEAUTIFUL VARIETY. [*Page* 234.]

and opening into a bladder-like sac. This in turn pours its fluid into a sort of reservoir found within a swelling at the base of the director, and thence is conducted to the wound along a channel between the director and the two pieces, each of the latter possessing a projection which acts as a piston.' When once a bee has made use of its sting, the piercers, on account of their being barbed at the tips, remain in the flesh of a victim, and their loss frequently causes the death of their owner. The poison weapons of female wasps and ants (for, as with the bees, it is only the fair sex which have the power to sting) are very similar to those of the bee, except for the fact that the styles lack the barbs at their extremities.

We have previously mentioned that the hairs which clothe the bodies and legs of the bird-eating spiders are of a very penetrating nature and capable of piercing the flesh of man and giving rise to an intense irritation; but this peculiarity is by no means confined to those creatures, for many of the hairy caterpillars are endowed with a similar means of repelling the too intimate attentions of mankind. Of these, one of the most familiar is the caterpillar of the processionary-moth which spins a large web to form a home or 'nest' wherein to retreat, and is clothed with barbed hairs capable of producing a severe irritation of the skin of those who come into contact thereto. Even the dust from the web produces a like effect.

Tennent records the existence of hairy and stinging caterpillars in Ceylon which 'descend by a silken

thread to the ground and hurry away, probably in search of a suitable spot in which to pass through their metamorphoses. Should they happen to alight, as they often do, upon some lounger below, and find their way to his unprotected skin, they inflict, if molested, a sting as pungent, but far more lasting, than that of a nettle or star-fish.'

The larvæ of the gold-tail-moth is yet another example which possesses irritating hairs, while, moreover, it is also capable of emitting an acrid fluid from glands which open upon the upper part of its body. Then, again, the larvæ of the puss-moth, although not clothed in hairs as the above-mentioned species, possesses a gland secreting a highly irritant fluid, embodying as much as forty per cent. of formic acid, and has the power to squirt the same at an enemy with the most painful results should it enter the eyes. Under normal conditions the squirting apparatus, composed of four branches, and pierced with small holes, lies concealed beneath a cleft in the creature's neck ; but when the larvæ is annoyed it protrudes that organ and discharges its fluid at the disturber of its peace. Poulton writes in reference to this caterpillar :—'So far as we know at present, no other animal secretes a fluid containing anything which approaches this percentage of strong acid. . . . I have seen a marmoset and a lizard affected by it, and have myself twice experienced sharp pain as the result of receiving a very small quantity in the eye.'

By the foregoing remarks it will be noted that quite a number of different types of animals rely

upon their power to secrete and utilise a poisonous fluid as a means of defence, and, in many cases, for overpowering their prey; and although some of them are more highly endowed than others as regards the virulence of their venom, yet all share the right to be included amongst the marvels of the Animal World.

CHAPTER XIV

A MIGHTY ATOM

THE deadly scourge of malaria has for long been a source of considerable danger to Europeans who travel in tropical climes; and although medical science has worked wonders in minimising the risks attending the dreaded fever, yet much remains to be done before the white man can be declared to be immune against its influence.

Of late years it has been discovered that mosquitoes are largely responsible for carrying the germs and inoculating the same into human beings, and, consequently, war has been waged against the larvæ of these pests in an endeavour to destroy them before they change into their winged state; for as the mosquitoes lay the eggs from which the larvæ emerge, in stagnant ponds or other suitable situations, the work of destruction is rendered much easier than would otherwise be the case if the insects themselves had to be dealt with.

In Barbados, where malaria is very prevalent, it has been found that some tiny fish—known as 'millions' on account of their being found in immense numbers within the shallow waters of that island,

and claiming the distinction of being the only fresh-water fish found in that region—feed largely upon the larvæ of mosquitoes, and thus serve to put a check upon the spread of the disease which the mature insects disseminate by piercing the flesh of human beings with their germ-carrying stings. This discovery has been turned to good account, and some years back arrangements were made between the Colonial Office and the London Zoological Society for the latter to keep a supply of the little fish in order that some of them might be exported, from time to time, to our various possessions abroad where much sickness is due to malaria. In October, 1908, the first consignment of millions, numbering one hundred and twenty individuals, left the Zoological Gardens for Uganda; there to be acclimatised and accomplish their errand of mercy. Needless to say, the task of conveying the fish, in the first instance from Barbados to London, and then again to Uganda, a total distance of nearly ten thousand miles, was a matter of some difficulty, and the method of packing them had to be thought out with great care. Empty kerosene tins were eventually made use of for that purpose, each one of which was enclosed in a larger wooden case, and, finally, a layer of two inches of sawdust was placed between the two in order to prevent undue jolting and to keep the water within the tins at an even temperature.

Numbers of these mighty atoms have since been exported to British Guiana, Bolivia, and the Malay States; and, according to reports, they have

accomplished much good work in destroying the larvæ of the disease-carrying mosquitoes.

The fish are quite small, the females barely attaining to an inch in length, and the males being somewhat smaller. In form they resemble minute tench. In regard to their colour, the former sex are of a dull olive-grey tint, but the males are dressed in a livery of blue, violet, red, and yellow, upon which some small circular and dark-coloured spots are present. Those which were kept at the Zoo were fed principally upon the water-fleas which abound in the hot-water tanks wherein the crocodiles and alligators dwell, but they would also partake of small pieces of hard-boiled eggs, biscuits, cornmeal, meat, and bread. After they had been in residence at the Gardens for a few weeks, a number of young ones were born. These were of special interest inasmuch as they arrived into the world in a fully-developed state, and were not hatched out from eggs or spawn laid by the females, as are the majority of fish. They are very hardy in captivity, and thrive well, provided the temperature of the water in their tanks is not allowed to fall below sixty-six degrees; but in their native home of Barbados the fish are said to live in quite warm water, and a temperature of eighty degrees is not too high for their liking.

CHAPTER XV

CONCERNING GOLDFISH AND THEIR KINDRED

IT is not generally known that goldfish are but a variety of the carp, and owe their existence to the Chinese and Japanese people who, since the early part of the sixteenth century, have kept them in a domesticated state and, by selective breeding, have succeeded in eliminating the sombre colouration of the ancestral stock and thereby produced the beautiful forms which are nowadays familiar to every one. The fish, which were first imported into Europe during the seventeenth century, vary in colour according to their age. During the first year of their life they are brown, after which they assume a silvery tint, and then as they grow older they gradually change to the wonderful golden hue which renders them such pleasing objects to look upon. Variegated forms, however, are by no means uncommon; while black specimens, although rare, are occasionally to be met with.

Goldfish are very suitable creatures for keeping as pets because of their hardy constitution; for

not only will they thrive in small tanks or glass bowls, but they will do equally well both indoors and out in the open. Great care, however, must be taken not to overcrowd them, and not more than two small specimens should be placed in a bowl measuring a foot across or else they will probably die for lack of a sufficient supply of oxygen in the water for their needs. A sure sign that the water is not sufficiently aërated is when the fish continually come to the surface in order to take a gulp of air through their mouths; and although this state of affairs can be remedied by withdrawing some of the water with the aid of a syringe and then squirting it back again, yet, after all, such a method is but a makeshift, and it is far better to remove some of the inmates of the aquarium so that those which remain may have plenty of room.

The fish are able to endure great extremes of heat and cold, but for breeding purposes they do best in warm water, a temperature of eighty degrees, or even ninety degrees, not being too high for their well-being. In factory towns they are frequently kept in tanks filled with the warm water discharged from the steam-engines, and although the supply of water is usually cut off on Sundays, with the result that its temperature becomes greatly reduced (especially during the winter months), and does not rise until the engines commence working again, yet, nevertheless, the fish do not appear to be in any way inconvenienced thereby. In an outdoor pond they will even

survive through a winter when the surface of the water becomes frozen; but it is always advisable to break the ice so as to ensure that the fish obtain enough air. It must not be imagined, however, that a person who keeps goldfish need not pay any attention to the temperature of the water within the aquarium, for nothing is more fatal than to place into warm water specimens that have been accustomed to live in cold water, and *vice versâ*. Another feature bearing upon the vitality of the creatures is that they can live for a considerable time out of water, and Buckland records having kept some for 'a night and half a day' wrapped up in wet grass and packed within a carpet bag. One difficulty attends the keeping of goldfish, for, unfortunately, they are somewhat subject to a disease caused by a fungus which grows upon their bodies; but if the malady be treated before it has spread too far, it can usually be cured by applying a weak solution of permanganate of potash to the affected parts.

It has frequently been stated that goldfish do not require any other food than the animalculæ found in the water wherein they dwell, but this is by no means correct, although they can live for a considerable time without any other form of nourishment. Crushed vermicelli, ants' eggs, small worms, aquatic larvæ, and greenstuff in the form of lettuce and watercress should be offered to them; while breadcrumbs, although liable to become sour and to taint the water if they remain therein for any length of time, are also appreciated.

The typical race of goldfish resemble the carp

in shape, but several extraordinary and freakish types have been evolved in which the tail, fins, and even the eyes have undergone a transformation. By far the most curious varieties are those known as pop-eyed goldfish or telescope fish, and the star-gazers, the enormous and protruding eyes of which frequently attain to the size of an ordinary marble; those of the former projecting sideways from the head, while those of the latter are directed upwards. The creatures are further remarkable on account of the fact that the dorsal fin is frequently absent. Owing to their rarity, these monstrosities command a good price and may cost as much as £5 each; but they can hardly be recommended for their good looks.

Very different, however, are the veil-tailed and the fan-tailed goldfish which may certainly be ranked amongst the beauties of the finny tribe. As suggested by their names, the caudal appendages of these fish are developed to a very marked degree, that of the veil-tailed variety being sometimes double, at other times three-lobed, and hanging down in graceful folds; while that of the fan-tail assumes a fan-like form.

The 'tumbler' is another curious type inasmuch as its head and tail bends upwards to such an extent as to cause the fish to tumble and roll about in the water when it is swimming; but the latest novelty in the goldfish line is that known as the 'lion-head,' a variety which comes from Japan and receives its name from the swollen and wrinkled nature of its face, suggesting the mane of a lion. It

was imported first into Europe during the year 1911.

Several of the variegated forms of goldfish have been given special names, but it is doubtful whether they are entitled to be regarded as distinct varieties. Of these, the 'superb-goldfish' is black and scarlet upon the back, and has the scales edged with gold, the under surface of the body being of a silvery tint. That known as the 'mottled-beauty' is black upon the dorsal region of its body, and the sides are decorated with blue, rose, yellow, and black pigments; while another kind, called the 'red-fin,' is distinguished by the brilliant scarlet tint of its head and fins, and bluish-black body. The variety termed 'the blue' is characterised by the metallic-blue tint of its back and sides.

Goldfish will breed readily in captivity, even when but a year old. It is only during the breeding season that the two sexes can be distinguished the one from the other; the males at that period developing a slight roughness upon the sides of the face. The eggs of the females are deposited upon the foliage of aquatic plants to the number of about 1,000, and after an interval of about a fortnight, the period varying according to the temperature of the water, the young ones hatch out. Unless the tank wherein they dwell is so shallow at one end that the adults are unable to gain access thereto, the fry should be immediately removed to separate quarters or else they stand a good chance of being eaten by their parents. It is even advisable to keep an eye on the infants themselves, for those

which hatch out first will frequently show a tendency to feed upon their younger and smaller brethren.

In addition to the goldfish, there are other varieties of the carp which have been evolved by artificial selection and breeding in a captive state, one of the most remarkable being the speigel carp or mirror carp, in which the enormous glistening scales are arranged in two or three longitudinal rows along the sides of the body and separated by bare skin. Occasionally, however, the scales are confined to the upper part of the back, and in such cases the fish are termed saddle-backs ; while old specimens which have lost the majority of their scales are commonly called leather carp.

Carp, which are stated to have been introduced into England about the year 1514, possess a larger brain in proportion to their size than any other fresh-water fish. They become very tame in captivity, and will even learn to perform tricks. A certain individual which was formerly kept at Fountain Park, San José, California, can claim the distinction of having had its doings recorded and illustrated in various newspapers and magazines. The fish was in charge of a gardener named Charles Riley, whose duty it was to clean out every week the basin of the fountain wherein it lived. As the man had a natural liking for animals he quickly won the confidence of the carp and succeeded in teaching it to perform a number of tricks. Not only would the creature feed from his hand and allow itself to be handled, but it even learned to come towards him when he whistled. As its education

proceeded, it was taught to wriggle out of the water, over the edge of the basin, and into the hands of its master; while, moreover, it would also pass under and over a stick or through hoops which were placed in the water, either by swimming in a normal manner or upon its side. It would afterwards progress backwards, and then conclude the entertainment by kissing the man as he bent over the water and placed his lips just under the surface.

During the winter months carp become very lethargic, retire to the bottom of their ponds and bury themselves in the mud. They grow very quickly, especially if kept in stagnant water, and have been known to weigh as much as twenty pounds; while their span of life has been estimated to be one hundred and fifty years or more.

In former days the fish were much appreciated as food in England; and Mr. G. C. Bateman tells us that on the Continent they are 'fattened by being suspended in the air in a net containing damp moss, and in that position they are fed upon bread and milk, put into their mouths with a wooden spoon.'

Mention must be made of the golden orfe and the golden tench which are so much admired for their beautiful colouring. The former, a variety of the ide found in Continental waters, is of a pale gold tint upon the back, and a silvery hue upon the under parts; while the latter, known also as the golden schlei, has been described as 'of a most lovely yellow colour mixed with the gleam of gold.'

The body of the tench is covered with a slime

which was formerly believed to possess the power to heal the diseases of other fish; and it was commonly reported that the voracious pike would always refrain from making a meal of the 'physician fish' as a mark of appreciation for the benefits it rendered.

CHAPTER XVI

A TALK ABOUT KANGAROOS

A CENTURY and a half has elapsed since Captain Cook and his party of navigators, when stationed at the Endeavour River, New South Wales, reported the discovery of a strange and unknown animal that sat up on its hind legs and moved along by successive long leaps.

We can well imagine the astonishment of the men when they first set eyes on the creature now known as the kangaroo, but nowadays we have become so accustomed to seeing them in Zoological Gardens and Parks that we are apt to regard them as more or less commonplace, and to overlook the fact that they are to be numbered amongst the most wonderful members of the animal creation.

The general appearance of a kangaroo is so well known that a detailed description is hardly necessary. Special attention, however, should be drawn to the hind feet, which are of a very specialised structure, the fourth and fifth, or two outermost toes, being the only ones that are visible externally, while the great toe is absent, and the remaining two are little more than slender rods, that are entirely

concealed beneath the animal's skin. The fourth toe is of considerable size and may measure as much as a foot in length, if we include the long and sharply-pointed claw and the backward-projecting metatarsal bone.

The female, as is well known, possesses a pouch for the reception of her young. The latter, when first born, are both blind and naked, but the most curious feature concerning them is that they are barely an inch in length and weigh but twenty-one grains. Directly the tiny creature is brought into the world the mother picks it up with her lips, then opens her pouch with her paws and places her offspring inside. When once it is there, she proceeds to place the mouth of her helpless babe against one of her nipples, to which it becomes fixed and immovable owing to the lips swelling around the teat. As the baby is not sufficiently developed to suckle on its own account, nature has provided the mother with special muscles which she is able to control so as to inject a supply of milk from her glands into the infant's mouth. In order that the young kangaroo may not choke during this process, it is endowed with a unique development of the larynx, or upper portion of the windpipe, which is prolonged in the region of the back of the nose to a level situated above the nipple to which the baby clings. By this means a free passage for air is assured through the nose, as well as one for conveying the milk through the gullet. When the infant is able to control its movements more fully, it becomes detached from the nipple, and in

due course the larynx becomes shortened and the creature breathes and swallows in a normal manner.

Not until the baby is about eight months old does it discard the shelter of its mother's pouch, although towards the end of that period it frequently takes an outing and explores the unknown world.

Kangaroos evince great affection for their progeny, and have even been known to shelter the bereaved offspring of some other kangaroo.

When hunted, the female will pick up her young one, even when she is running at full speed, and endeavour to bolt off to safety. If hard pressed, however, and she sees that her pursuers are overtaking her, she turns her 'Joey' out of her pouch and makes off with increased speed; but should she succeed in shaking off her enemies, she will ultimately return to search for her young one.

Under the general term of 'kangaroo' are included the typical kangaroos, the wallaroo and the wallabies, the latter being the smallest kinds, some of them being no larger than a rabbit. All are vegetarian in diet, their food consisting of grasses—more especially that known as 'kangaroo grass'—and shoots of shrubs. The wallabies, however, will also eat roots.

Of a timid and shy disposition, they confine their activities principally to the early morning and evening, resting during the daytime and relying upon their acute senses of sight, smell, and hearing, as well as their speed of foot, to keep them free from danger. As a rule they are of a harmless disposition,

but during the mating season the males are liable to become bad tempered and even dangerous.

The animal's strong legs and long toes armed with sharp claws prove formidable weapons of offence, the creature facing its enemy, rearing itself up and momentarily balancing itself on its thick tail, and striking forwards and downwards with a mighty stroke that will rip up a man's body.

One of the largest of the kangaroos is the red-kangaroo (*Macropus rufus*), a full-grown male measuring about eight feet in length, inclusive of its tail. It receives its name from the reddish tint of the male's fur, especially that upon the throat, but the fur of the female, frequently spoken of as the 'flying doe' on account of its great speed, is grey. In distribution it is confined to Southern and Eastern Australia, where it is found amidst the rocky districts.

Another large species is the grey or great kangaroo (*Macropus giganteus*), known by the colonists as the 'boomer,' 'old man,' or 'forester.' Unlike the red-kangaroo, it dwells in the open plains.

The wallaroo (*Macropus robustus*) of Queensland, New South Wales and South Australia, sometimes spoken of as the great rock-kangaroo, is readily distinguished from the typical kangaroos by the nature of its coat, this being long, thick, and smoky-grey in colour. It lives amidst the rocky regions and is stated to be more dangerous than other kangaroos on account of its habit of attacking its enemies and causing them to fall from the rugged heights.

Passing to the wallabies, we come to a group comprising numerous species, the larger ones being known as brush-wallabies owing to their being found amidst the dense scrubby jungle or 'brush.' Some of the most familiar are the red-necked wallaby (*Macropus ruficollis*) of New South Wales and Victoria, a creature attaining to a length of over five feet; while the agile wallaby (*Macropus agilis*) found in New Guinea, Queensland, and South Australia, a species characterised by the presence of a white stripe on the upper part of the leg, and the black-tailed wallaby and Parry's wallaby are other kinds all of which have been represented in the collection at the London Zoological Gardens from time to time.

Another group, known as rock-wallabies (*Petrogale*) are distinguished from the foregoing owing to the tail being unusually slender and clothed in long instead of short hair, this increasing in length as it reaches the extremity where it terminates in a pronounced tuft. The former wallabies, moreover, inhabit the plains, whereas the rock-wallabies favour rocky country.

Then, again, there are the spur-tailed wallabies (*Onychogale*) which are peculiar in the fact that the extremity of the tail is furnished with a small, horny and spur-like nail concealed beneath the fur, of a similar nature to that possessed by a lion. The use of this curious structure is unknown.

Other members of the family are the hare-wallabies, which receive their name on account of their resemblance to a hare, both in shape and

size, and the rat-kangaroos or portoroos, the latter being divided into nine different species, comprising four genera, all of which inhabit Australia and Tasmania. The rat-kangaroos are nocturnal in habits and, as already mentioned in a previous chapter, are in the habit of constructing nests within which they hide and rest during the daytime.

In the musk-kangaroo (*Hypsiprymnodon moschatus*) we have an animal which is regarded as forming a connecting link between the rat-kangaroos and the phalangers. Sometimes known as the five-toed kangaroo, this creature is only found in Queensland. In general appearance it greatly resembles a large rat, its muzzle being very pointed, and its tail being devoid of hair and covered with scales. It is only found in the forests of Queensland, and, unlike other members of the kangaroo family, feeds upon insects and worms, in addition to a diet of roots and berries. The female, moreover, frequently gives birth to two young ones instead of a single one. The species is stated to be fairly plentiful in its habitat, but owing to its retiring disposition it is seldom captured, and no living examples have ever been seen in this country.

Although the majority of kangaroos have exceptionally long and powerful hind-legs, by means of which they can progress in a series of bounds, yet certain species, known as tree-kangaroos, are unique on account of their hind-legs being but little longer than their fore-legs, with the result that they are unable to execute the enormous bounding leaps

that their longer-legged brethren can accomplish. Such being the case, one would naturally expect to find that their lack of ability in such respect would prove detrimental to the well-being of the species ; but in our endeavours to solve the problems which Nature confronts us with, it is important that we should first of all inquire into the ' why and the wherefore,' and the surest means of clearing up any difficulties or doubts is to discover the habits of the animals with which we are concerned. If, then, we proceed to inquire into the mode of life of the tree-kangaroos, it will be clearly brought to mind that the possession of long hind-legs would not be at all advantageous to the creatures, for, as their name implies, they are arboreal in habits and spend the greater part of their time amidst the branches of trees, feeding upon the leaves, and, consequently, the need for them to jump to any extent does not arise.

The distribution of the tree-kangaroos, of which there are several species, is confined to New Guinea and Northern Queensland. The animals are of a very timid disposition, and as they resort to the remote and dense forests of their habitat, and are largely nocturnal in habits, very few naturalists have ever had the opportunity of observing them in a wild state. According to native reports, however, the creatures never drink ; and although this statement may appear to be somewhat remarkable, yet it is by no means an uncommon circumstance for arboreal mammals to abstain from imbibing water, for they are able to obtain a

sufficient supply of liquid for their needs from the moisture which is contained in the leaves upon which they so largely subsist.

Very few living specimens of tree-kangaroos have ever been seen in this country, but, judging from those which the writer has known, they have quite a hardy constitution and are by no means difficult to keep in captivity.

A photograph of a pair of ursine tree-kangaroos appears as our frontispiece.

INDEX

A

Acorn barnacle, 84
Adder, 206
Albumen, 146
Alligator, 63
Ambergris, 149
Ammonia, 146
Amphisbæna, 79, 187
Anemones, 82, 83, 220
Angler fish, 83
Animal fights, 32
— locomotion, 187
— products, 137
— sanctuaries, 105
Animals as prize-fighters, 32
— which give electric shocks, 180
— which sham death, 19
Ant, 78, 79
Antelopes, 26, 165, 166, 167, 193
Antlers, growth of, 168
Aphides, 78
Apteryx, eggs of, 56
Argonaut, 201
Armadillo, 176
Astrakhan, 45, 51
Axolotl, 141
Aye-aye, 125
Azara's dog, 25

B

Ban dog, 41
Barnacle, 84
Barwal sheep, 49
Bear, 37
— baiting, 40
— gardens, 41
Beaver, 134, 157
Beaver-rat, 82
Bee, construction of sting, 224
Beetles, 78, 141, 185
Biltonge, 140
Bird-eating spider, 157, 220
Birds, locomotion of, 197
— speed of flight, 197
Bison, preservation of, 112, 119
Black buck, 86
Bones: use in commerce, 146
Budding, 54

Bull-baiting, 41
— fighting, 43
— rings, 42
— running, 42
Burrowing owl, 80

C

Cameos, 154
Cape polecat, 92
Capuchin monkey, 191
Caracal, 89
Carmine, 145
Carp, 236
Caterpillars, 84, 185, 201, 225
Cat-fish, 83
— gut, 144
Centipede, 141, 222
Chain-viper, 214
Chamois, 144, 165
Charcoal, 146
Cheetah, 86
Chevrotains, 26, 27, 163, 193
Chinchilla, 92
Civet, 150
Cobra, 157, 208, 211
Cock-fighting, 37
— penny, 39
— pits, 39
Cod, eggs of, 68
Coliseum, animal fights in, 37
Concerning eggs and those that lay them, 54
— goldfish and their kindred, 231
Conch shells, 154
Coral, 155
Cormorant, trained, 104
Corn-crake, 29
Cowry shells, 153, 156
Coypu rat, 131
Crab, hermit, 83, 84, 203
Crabs, eaten alive, 141
Cramp fish, 184
Crocodile, 37, 63
— bird, 81
Curious messmates, 75
— sheep, 45
Cuscus, 26, 190
Cuttlefish, 66, 145, 177, 201

D

Darwin's frog, 21
Dassie, 194
Deer, 163
Diana monkey, 28
Dog, Azara's, 25
— dingo, 24, 140
— fish, eggs of, 68
Dormouse, 129
Dove, 31
Duck, wild, 31
Duckbill, 54, 82, 172, 204
Dumba-wala, 51

E

Earless sheep, 53
Echidna, 54, 56, 57, 59, 170, 172, 204

Egg-tooth, 61, 64
Eggs, incubation period of, 73
Egyptian cat, 90
Electric cat-fish, 183
— eel, 180
— ray, 184
— star-gazer, 185
Elephant, 160
Elephant sheep, 47

F

Falconry, 95
Fat-rumped sheep, 50
Fat-tailed desert-mouse, 52
— sheep, 50, 52
Ferret, 91, 92
Fire-bellied toad, 20
Fish, eggs of, 68
— fighting, 33
— locomotion of, 198
— scales of, 147
Flamingo, 140
Foster-mothers, 77
Four-horned antelope, 166
Foxes trained to catch rats, 93
Frogs, 21, 67, 80, 81, 142, 173, 194, 218

G

Galagos, 124
Gall, 145, 156
Game reserves, 109
Garden dormouse, 130
Garial, 65
Geckos, 195
Gelatine, 142, 156
Genet, 92, 150
Gerfalcons, 102
Giant tortoise, 65
Gibbon, 121, 188
Gila monster, 216
Giraffe, 163, 167
Gladiators, 37
Globe-fish, 199
Glue, 45, 143, 144, 146
Gnat, eggs of, 71
Goat, 45
Gold-beaters' skin, 144
Golden eagle, 103
— orfe, 237
— tench, 237
Goldfish, 231
Goliath beetle, 141
Gopher frog, 81
— tortoise, 81
Gorilla, 121, 188
Goshawk, 101
Green turtle, 141
Guano, 140
Guillemot, eggs of, 55

H

Hamadryad, 211
Hare, 132
Harvest mouse, 128
Hausa sheep, 52
Hawksbill turtle, 150
Hedgehog, 170
Heloderm, 52, 216
Hobby, 102

Hog-nosed snake, 22
Honey-dew, 78
Horned viper, 212
Horns, 164, 168
Hunia (fighting ram), 36
Hunting leopard, 86
Hyrax, 194

I

Iguanas, 141, 174
Indian-ink, 143
Isinglass, 142, 143
Ivory, 151, 161
— black, 145

J

Jelly fish, 82, 203, 220
Jerboas, 189
Jumping hare, 190
— mouse, 130, 189

K

Kanchil, 26
Kangaroos, 133, 176, 189, 239
Kites, 96
Kiwi, eggs of, 56
Klip-das, 194
Krait, 211

L

Lac, 145
Lace-wing fly, eggs of, 70
Lackey moth, eggs of, 72
Land-rail, 29
Lapwing, 30
Leg spurs of birds, 172
Lemurs, 124
Lizards, 24, 52, 66, 80, 82, 140, 141, 170, 174, 187, 194, 195, 200, 216
Locust, 141
Lynx, 89

M

Mammals as nest-builders, 121
Man-like apes, 121
Mantes, 33
Markhoor, 50, 165
Marmot, 80
Merino sheep, 46
Merlin, 103
Mermaids' purses, 68
Mice, as food, 139
— harvest, 128
— jumping, 130, 189
— spiny, 170
— white-footed, 131
Millions, 228
Millipede, 222
Mink, 92, 133
Mites, 78
Mole, 133
Mongoose, 92
Monkeys, 28, 76, 121, 124, 138, 190, 191
Mouflon, 46

Mountain meal, 156
Mouse-deer, 26, 163, 193
— lemurs, 124
Mulligong, 58
Musk, 150
— kangaroo, 244
— rat, 152

N

Narwhal, 162
Nereis, 84
Numb-fish, 184

O

Octopus, 177, 201
Offensive and defensive weapons of animals, 159
Oil, 147
One-horned sheep, 47
Opossum, 25, 190
Orang-utan, 121, 188
Otter, 94
Owl, burrowing, 80
Oyster, eggs of, 69

P

Parasites, 77, 200
Parasol ants, 79
Parchment, 45, 143
Partridge, plumed, 31
Peacock, 140
Pearls, 152
Peewit, 30
Pemmican, 140
Pepsine, 157
Perch, eggs of, 69
Peregrine falcon, 97, 102
Persian lamb, 51
Pinnipeds, 192
Plant-lice, 78
Platypus, 54, 56, 57, 61, 81, 172, 204
Plover, 31, 81
Poisonous animals, 204
Polecat-ferret, 91
Porcupine, 147, 169, 190, 191
Pounce, 145
Prairie dog, 80
— marmot, 80
Praying insects, 33
Proctotretus, 24
Proechidna, 62
Prongbuck, 167
Protection of animals, 107, 118
Puff adder, 215
Puss moth, 178, 226

Q

Quails, 40

R

Rabbit hunting, 91
— pest of, 106
Rat, 131, 132, 139
— kangaroo, 133
Rattlesnake, 23, 80, 148, 157, 214

Ray, 171, 219
Rhinoceros, horn of, 164
— viper, 213
Rock-badger, 194
Rooks attacked by falcons, 97
Royal antelope, 26
Ruffed grouse, 31
Russell's viper, 214

S

Sacer falcon, 102
Saüba ants, 79
Saw-fish, 178
Scorpion, 222
Sea lion, 192
— slug, 178, 219
— unicorn, 162
Seal, 192
Sepia, 68, 145, 177, 201
Sha, 46
Shagreen, 144
Shammy-leather, 144
Shanghai sheep, 53
Sheep, 36, 45, 53, 165
Shrike, 40
Shrove Tuesday and cock fights, 39
Silk-worm, 141, 151
Size, 143
Skate, 68, 171, 185
Skink, 66
Skunk, 156, 174
Sloth, 193
Slow-worm, 66
Snails, 70, 142, 153, 202
Snakes, 22, 23, 66, 80, 140, 148, 157, 200, 205
Snake stone, 210
Some curious sheep of foreign lands, 45
Soothsayers, 33
Sparrow-hawk, 103
Spermaceti, 149
Spiders, 157, 220, 221, 222
Spiny ant-eater, 54
— mice, 170
Sponges, 83, 84, 155
Springhaas, 190
Squirrel, nest of, 132
— dormouse, 130
Starling, 81
Stick insects, eggs of, 55
Sticklebacks, 171
Sting bull, 218
— ray, 219
Stoat, nest of, 132
Sword-fish, 178

T

Tallow, Russian, 45
Tambreet, 58
Tarantula, 157, 221
Thorn moth, eggs of, 55
Thresher shark, 174
Tinamou, 30, 56
Toads, 20, 67, 176, 216
Torpedo, 184
Tortoise, 65, 80, 81, 148
Tortoiseshell, 150
Tree-kangaroos, 245
Triton shells, 154

Tuatera lizard, 82
Turtle soup, 140
Tusks, 160

U

Unicorn sheep, 47
Urial, 46

V

Vellum, 143
Venom of snakes, 157, 205, 215
Viper, common, 206
Vole, 131

W

Wallaby, 241, 243
Wallachian sheep, 50
Wallaroo, 241, 242
Walrus, 160, 161, 192
Wash leather, 144
Water mole, 58
— rail, 30
Weasel, 92
Weaver fish, 218
Whelk, eggs of, 68
Wild animals which are trained by man to hunt, 86
Willow ptarmigan, 31
Wing spurs of birds, 173
Wood-louse, 31
Wool, 45

Y

Yellow-bellied toad, 20

Z

Zorilla, 92, 174

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